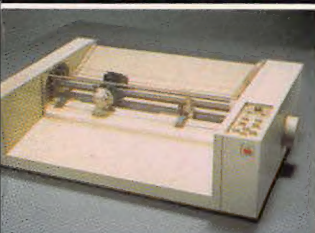


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# APPLE® II/IIe/IIc EXPANSION GUIDE



GARY PHILLIPS & MICHAEL FISHER



# **APPLE® II//IIe//IIfc EXPANSION GUIDE**

**GARY PHILLIPS & MICHAEL FISHER**



**TAB BOOKS Inc.**

Blue Ridge Summit, PA 17214

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# Contents

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<b>Acknowledgments</b>	<b>ix</b>
<b>Introduction</b>	<b>x</b>
<b>Chapter 1 Price, Performance, and Quality</b>	<b>1</b>
Interfaces and Expansion Hardware	1
Reviews	2
Different Systems for Different Purposes	2
<b>Chapter 2 The Apple II Family</b>	<b>4</b>
Family Members	5
Peripherals	9
<b>Chapter 3 Apple Hardware Shopper's Guide</b>	<b>11</b>
Smart Shopping at Retail Stores	11
Smart Mail-Order Shopping	12
Smart Shopping at Computer Fairs	13
Smart Shopping for Used Equipment	13
<b>Chapter 4 Methods of Evaluation and the Selection Process</b>	<b>15</b>
Background Information	15
Reviews: Methods of Evaluation	15
A to D Rating System and List of Features	16
Selection of Products for Review	16
The Five Criteria Used in Evaluating Products—Structure of the Reviews—Groups of Related Products	17
Worksheet for Reviewing Additional Products	18
Comparative Tables of Ratings and Features	18
The Hardware Selection Process	18
<b>Chapter 5 Dot-Matrix Printers</b>	<b>20</b>
Characters	20
Ribbons	21
Paper	21
Buffers	21
Interfaces	21
Function and Use	22
Setting Up a Word Processor	22

- Dot-Matrix Printers 22
- Alphacom 81 24
- D-100 25
- D-200 26
- D-300 28
- Delta 10 and Delta 15 29
- FX-80 and FX-100 31
- Gemini 10X and Gemini 15X 33
- Imagewriter 35
- LQ-1500 37
- Microline 82A and 83A 39
- Microline 84 Step 2 40
- Microline 92 and 93 42
- MT 160L and MT 180L 44
- Quadjet 46
- Qantex 7065 48
- RX-80, RX-80FT, and RX-100 49
- Scribe 51
- Spirit 80 53
- STX 80 55
- TTXpress 56
- Worksheet for Dot-Matrix Printers 58

## **Chapter 6 Fully-Formed-Character Printers**

**62**

- Daisy-Wheel Printers 62
- Other Types of Fully-Formed-Character Printers 63
- Apple Daisy Wheel Printer 64
- CR-II 65
- CR-III 66
- Diablo 630 ECS 67
- DX-15 68
- EXP-500 70
- F-10 Printmaster 71
- F-10 StarWriter 72
- HR-25 73
- Juki Model 6100 74
- NEC 2050 Spinwriter 76
- NEC 3550 Spinwriter 77
- Olympia ESW 3000 78
- Olympia Electronic Compact RO 79
- Power Type 80
- Style Writer 82
- Transtar 120 84
- Transtar 130 85
- TTX-1014 86
- Worksheet for Fully-Formed-Character Printers 87

## **Chapter 7 Interface Cards**

**90**

- Alphabits Printer Interface 92
- APIC Printer Interface 93
- AP-830 Serial to Parallel Converter 94
- Dispatcher Printer Interface 94
- Graphicard Printer Interface 95
- Hamlet Serial-to-Parallel Converter 95
- Microbuffer II+ Printer Interface 96
- Microbuffer II Printer Interface 97
- Nice Print Printer Interface 97
- Parallel Interface Card I/e 98
- Pkaso/U Printer Interface 99
- Printerface Printer Interface 100

PrinterMate Printer Interface 100  
 Print-It Printer Interface 101  
 PSIO Printer Interface 102  
 Serial to Parallel Adaptor 103  
 SerialI Printer Interface 103  
 Super Serial Card //e Printer/Modem Interface 104  
 UniPrint Printer Interface 104  
 Worksheet for Interface Cards 105

## Chapter 8 Modems

108

Transmission Speed 108  
 Connecting the Modem 109  
 One-Way or Two-Way Transmission 109  
 Features 109  
 Information Services 110  
 Apple Cat II 111  
 Apple Modem 113  
 Hayes Micromodem II//e 114  
 Hayes Smartmodem 300 115  
 Hayes Smartmodem 1200 116  
 NETWORKER 117  
 Password 117  
 ProModem 1200A 118  
 VOLKSMODEM 119  
 X100 POPCOM 120  
 Worksheet for Modems 120

## Chapter 9 Monitors

122

General Information 122  
 Monochrome Monitors 123  
 Color Monitors 123  
 Using a TV 123  
 Monitor Interfaces 124  
 Buying Tips and Tricks 124  
 Amdek Color 400 125  
 Amdek Color 500 125  
 Amdek Color 600 126  
 Amdek Color 710 128  
 AU 9191 U 129  
 Color I 129  
 CR-5400 130  
 CR-5600 131  
 CR-6500 132  
 JB-1260MA 133  
 Monitor //e 133  
 Monitor //c 134  
 PI 1, PI 2, PI 3, and PI 4 136  
 Princeton HX-12 137  
 RGB-1400PC Display 138  
 SC-100 138  
 SG-1000 139  
 Worksheet for Monitors 140

## Chapter 10 RGB Cards

143

DVM-80E 144  
 DVM-II 144  
 RGB-SL7 145  
 64K RGB Interface 145  
 //c RGB Interface 146  
 Worksheet for RGB Cards 147

## **Chapter 11 Wide Display Cards**

**149**

Apple 80 Column Card 150  
eRAM 80 151  
Memory Master IIe 151  
Smarterm II 153  
Ultraterm 153  
Videoterm 154  
Viewmaster 156  
Worksheet for Wide Display Cards 156

## **Chapter 12 Disk Drives**

**158**

Disk Drive Operation 158  
Diskettes in General 159  
Reviews 159  
Apple Disk IIe 160  
Apple Disk IIc 160  
A2 Drive 161  
A82 Drive 161  
AP-100 Drive 162  
AP-105 Drive 162  
AP-110 Double Drive 162  
AP-120 Disk Controller 163  
APS-M Drive 163  
C-111 164  
C-130 164  
DD Controller 165  
Distar 165  
Distar DuoDrive 165  
Duodisk 166  
Elite 1 166  
Elite 2 167  
Elite 3 168  
Elite Controller 169  
MiniTaur 169  
Mochinon Drive 171  
Pace AP Standard Drive 171  
Pace AP Half Height 171  
Pace AP 2-in-1 Drive 172  
PPW Drive 172  
SA390-E Drive 173  
Taur II 173  
Taur II+ 174  
Vista Solo 174  
V1200 175  
Worksheet for Disk Drives 175

## **Chapter 13 Hard Disk Drives and Local Area Networks**

**177**

Hard Disk Drives 177  
Hard Disks 177  
Local Area Networks 179  
Reviews of Hard Disks 180  
B-700 180  
Corona Starfile 181  
Digital Electric Hard Disk 181  
Infax 101A 182  
OMNIDRIVE 182  
Profile 183  
Pro Series 183  
QC10 184  
Q-500 184

SQ-5BA 185  
Trustor Information Modules 185  
X5 186  
5MB 186  
5+5 187  
Reviews of Local Area Networks 187  
OMNINET 187  
PLAN 4000 188  
Worksheet for Hard Disks 189  
Worksheet for Local Area Networks 189

## **Chapter 14 RAM Cards 192**

Axlon RAMdisk 193  
Legend RAMcard 194  
Synetix Flashcard 194  
Titan RAMcards 195  
Worksheet for RAM Cards 196

## **Chapter 15 Clocks 198**

ProClock 199  
Thunderclock 200  
Timemaster II H.O. 201  
Worksheet for Clocks 202

## **Chapter 16 Sound Cards 204**

Cricket 205  
Echo+ 206  
MC1 206  
MC16 207  
Mockingboard 208  
Super Music Synthesizer 209  
Worksheet for Sound Cards 210

## **Chapter 17 Pointing Devices 212**

Game Controllers 212  
Light Pens 213  
Touch Tablets 214  
Mouse 214  
Adam & Eve Paddles 215  
AJS200 216  
Apple Joystick 216  
Apple Mouse II 217  
Gibson Light Pen 218  
KoalaPad 219  
Kraft Joystick 220  
Mach III 221  
Magellan Light Pen 221  
Paddiesticks 222  
Powerpad 222  
Worksheet for Pointing Devices 224

## **Chapter 18 Keyboard Replacements and Enhancements 227**

Replacement Keyboards 228  
Specialty Keyboards 228  
Keyboard Enhancers 228  
Apple Numeric KeyPad II 229  
Enhancer II 229  
EPS Keyboard 230



Keyport 717 231  
 Key Tronic KB200 232  
 Keywiz VIP 232  
 KVA II Multi Function 233  
 The Keypad 233  
 I/e Tender Keypad 234  
 Worksheet for Keyboards 234

## **Chapter 19 Z-80 Coprocessors 236**

ALS CP/M Card 238  
 Appli-Card 238  
 CP/M Gold Card 239  
 E-Z Card 240  
 Premium SoftCard I/e 241  
 Softcard II 242  
 Z Engine 243  
 Z-80 Plus 243  
 Worksheet for Z-80 Coprocessors 244

## **Chapter 20 Specialized Peripherals 246**

Buffers 246  
 Controller/Buffers 246  
 Plotters 247  
 Power Protection Devices 247  
 Security 248  
 Angel Buffer 249  
 Datasaver Standby Power System 250  
 DataShield Model 100 Surge Protector 251  
 DataShield Backup Power System 252  
 DES 2000 Security System 254  
 DMP-29 Plotter 255  
 DMP-40 Plotter 255  
 Interfazer Controller/Buffer 256  
 Lemon/Lime/Peach/Orange Surge Protectors 257  
 The MAX SS/2 Surge Protector 257  
 Microbuffer/E Buffer Interface Card 258  
 Microbuffer In-Line Buffer 259  
 Microfazer Buffer 259  
 Micro-UPS, Model 3056 261  
 Minicomputer Regulator Super Isolation Transformers 261  
 Mini UPS 262  
 Multiport Controller/Buffer Model 524 263  
 Power Line Monitor 264  
 Powermaker Micro UPS 265  
 SC14 Signal AC Line Conditioner 266  
 ShuffleBuffer 266  
 Spikemaster Surge Protector 267  
 SPS Standby Power Source 268  
 Worksheet for Specialized Peripherals 268

## **Appendix A Vendors 270**

## **Appendix B Bulletin Boards 276**

## **Glossary 291**

## **Index 304**

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# Introduction

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This book is the tool needed by every owner of an Apple II, *IIfx*, *IIc*, or II + who wants to buy expansion hardware. We have chosen the best from hundreds of competitive products and reviewed them in an orderly and consistent format to make effective comparison shopping possible.

The differences between members of the Apple II family are covered in Chapter 2. One chapter is devoted to each major type of device, providing in-depth background knowledge, evaluative reviews of the best available products, and comparative tables of vital statistics and features. Two appendices provide addresses of vendors and phone numbers of user groups.

One of the problems facing the owner of an Apple computer is that an Apple II is different from an Apple II +, which is different from an Apple *IIfx*, which is different from an Apple *IIc*. In deciding on a hardware purchase, this problem sometimes makes all the difference in the world as to which selection is best for you. In other purchases, the similarities between members of the Apple family indicate a similar selection, regardless of which Apple computer you own. In this book we have been careful to note where the differences between machines make a difference in your decision. We have even noted where the difference in machines make a device useful for one machine and useless for another.

Additionally, unlike other books which reproduce information from manufacturers' brochures, these reviews reflect hands-on use of the products. We point out the flaws and disadvantages of products as well as the strong points and features.

The four opening chapters provide a comprehensive overview of Apple II, II+, IIe, and IIfx expansion, including how the various devices are connected to the computer. We describe a systematic process for using the reviews and the accompanying tables to find the best expansion products for your special requirements. Hundreds of hours have gone into the reviewing process, and you can have the benefit of all of this research in a few hours of reading. This book can help you wade through the confusing multitude of products available. Now you can select the products that best suit your needs quickly, accurately, and confidently. You can be sure to avoid overpriced but underperforming products, and be sure to get the greatest possible computing power for your money.

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# Chapter 1



## Price, Performance, and Quality

The Apple II, II +, *IIfx*, and *IIc* are the most popular personal computers. The Apple is a machine with extraordinary potential usefulness. Still, the basic Apple computer is limited in many ways. It requires significant hardware expansion in order to perform many of the more interesting and valuable tasks which personal computers are capable of, such as printing documents, telecommunications, etc. This statement is, of course, true of nearly all of the other computers on the market, as well.

### INTERFACES AND EXPANSION HARDWARE

The expansion slot of the Apple II, II +, and *IIfx*, and the interfaces of the Apple *IIc* open the door to unlimited hardware expansion through interfaces. An *interface* is a hardware device complying to a standard defining the types of connections (plugs), the electrical specifications, and the sequences of control signals which allow a computer and a peripheral to work together. The interface bridges the gap between the Apple and a peripheral (expansion product). In some cases the interface may be part of the expansion devices, as in the case of an internal modem (for the II, II +, or *IIfx*), which is a serial interface and a modem on a single expansion board.

Most peripherals made for a variety of personal computers comply to interface standards available on the Apple. These peripherals include the Centronics parallel printers and various RS-232C serial devices such as modems and serial printers.

Through the expansion interfaces built into or available for Apple computers, a vast array of accessory hardware products are available for Apple users. The

problem of making a wise choice is very similar to the problem of choosing a computer. Peripherals span a broad range of prices, performance, and quality. It is not always true that the most expensive peripherals have the highest performance or the highest quality. Many peripherals are significantly overpriced, and some have fatal flaws.

## **REVIEWS**

In the following chapters, we will give you a general background as to how the various peripherals work, what they are good for, and what the potential purchaser should look for in the way of features and pitfalls for the various devices. We have examined a broad cross section of available devices that can be used with the Apple II, II+, IIe, and IIC from a number of points of view.

All of the information for a given type of device is summarized in a tabular format, allowing rapid and easy comparison of all the devices of that type. In addition, for each type of device, we will give you our personal recommendations. In some cases, there is one device that is so outstanding in all respects we can simply recommend it as the device to purchase. In other cases, the device that will be of greatest value to you will depend on what you need it for. For example, many fine dot-matrix printers will not adequately do the job of presenting an acceptable business or personal letter. Similarly, the price of a color monitor is only justified for those who have some definite need for color.

Because price, quality, and performance are not as closely related as they may appear, there are many pitfalls the purchaser of expansion products should be aware of. The other side of this coin is that there are many bargains to be had by the informed purchaser. The purpose of this book is to give you the necessary background information to make knowledgeable hardware expansion choices.

## **DIFFERENT SYSTEMS FOR DIFFERENT PURPOSES**

The Apple has almost unlimited potential for assisting in the performance of various tasks, ranging from business applications to entertainment and education. For any particular application you may wish to pursue, you will need to acquire appropriate peripherals. There is no particular peripheral that all Apple users would need to have. Which peripherals you will want to add to your system depends totally on what you want to do. For example, if you are an avid computer game player, you will certainly want to add a joystick, possibly a color monitor, and other game-related items to your computer.

If your main application is word processing, you probably will want a good-quality printer, possibly fully formed characters, and a second disk drive on which to save the documents you create. Business applications will generally require a disk drive and a printer. Both word processing and business applications can benefit from the more readable characters presented by a monitor in place of a television set. As the volume of work and of documents increases, both additional RAM (random-access memory) for the II, II+, and IIe and large-capacity disk storage become desirable.

Finally, your interest may be in tapping the many on-line databases and the community of personal computer users available through the use of a modem and phone lines. Telecommunications and the use of a modem may also play an important

role in programming, processing business applications, or other uses of the Apple. A modem opens up a whole world of possibilities, knowledge, interaction, and availability of free software from the public domain.

Whatever your major purpose for expanding your Apple, there will be many candidates for your purchase. This book will guide you in finding the best value for your money and will help you avoid the agony of paying good money for a device which does not work properly.

# Chapter 2



## The Apple II Family

Since the introduction of the Apple II in 1976, three new Apple computers have joined the Apple II computer family. In order of their introduction, the family currently consists of: the Apple II, the Apple II+, the Apple IIe, and the Apple IIc.

These four computers cover a range of features, expandability, and intended uses. The ways you will actually use and expand your computer will certainly go far beyond Apple Computer Incorporated's original intention, at least if you are one of those users willing to do some exploring with independent software and expansion hardware. This chapter will provide a brief review of the similarities and differences between the Apple II family. While all of the Apple II family are very similar in their functional appearances when running many programs, large differences lurk behind this facade of compatibility.

One of the most attractive characteristics of the Apple II family is the high level of compatibility between its members. The term *compatible*, applied to a computer, means that it can use either hardware or software designed for another computer. If a system can use hardware or software that was designed for a system introduced at an earlier time, it is said to be *downwardly compatible* with that system.

Each newer member of the Apple family is, for the most part, downwardly compatible in its use of most software with its earlier siblings. The Apple IIe is basically downwardly compatible with the Apple II and II+, although there are some exceptions. Hardware compatibility between the Apple IIc and other members of the family is more problematic.

## FAMILY MEMBERS

The original Apple II uses 16K RAM memory chips (although some of the early models of the Apple II used either 4 or 16K chips), has Integer BASIC as the resident language on the motherboard, has an uppercase only keyboard and display, and comes with 16 to 48K of built-in RAM. The keyboard has no auto repeat feature, and there are eight peripheral expansion slots including a special slot, slot 0, that appears like the other slots but is used for special purposes.

The Apple II+ is similar to the Apple II, except that it has only 16K RAM chips and has Applesoft as the resident language on the motherboard. It also has the Autostart ROM monitor which results in automatic booting of a disk upon starting the machine.

The Apple IIe (Fig. 2-1) is different in many respects from the Apple II and II+. It comes with 64K of built-in memory, using 64K RAM chips. It has an upper- and lowercase keyboard and display. There are special keys on the keyboard (called Open-Apple and Closed-Apple), and all keys are auto-repeating. Slot 0 no longer exists, although there is a new expansion slot, which differs visibly from the others and is called the *auxiliary slot* (Fig. 2-2). It is specially designed for 80-column display boards.



Fig. 2-1. The Apple IIe is an updated version of the Apple II+ (courtesy of Apple Computer, Inc.).





Fig. 2-2. The Apple *IIe* has 64K of RAM, uses the 6502 microprocessor, and has eight expansion slots (courtesy of Apple Computer, Inc.).

The Apple *IIe* has Applesoft as its resident language. It has an expanded monitor ROM with built-in diagnostics. It also has a special game I/O connector on its back side (a D-connector or DB-9 plug). This is in addition to the "standard" 16-pin DIP connector on the motherboard.

As a result of the changes made by the Apple *IIe*, some of the hardware devices made for the Apple II family changed or are no longer needed for the *IIe*. Apple II and II+ owners need 16K RAM cards; Apple *IIe* owners do not. Apple II and II+ owners can use RAM cards which have straps for inserting in the Apple motherboard; Apple *IIe* owners cannot. Apple II and II+ owners need special upper- and lowercase keyboard modifiers and display devices; Apple *IIe* owners do not. Apple *IIe* owners can use specially designed 80-column display cards which fit in the auxiliary slot; Apple II and II+ owners are restricted to standard 80-column display

cards. Apple *IIfx* owners can use devices for connecting to a 16- or 9-pin game I/O port; Apple II and II+ owners are restricted to those devices which connect to a 16-pin port.

The Apple *IIfx* differs markedly from the *IIfx*. (See Fig. 2-3.) It has no expansion slots, but instead features expansion ports (Fig. 2-4). It comes as the equivalent of an Apple *IIfx* with an extended 80-column display card in the auxiliary slot, a super serial card in slots 1 and 2, a mouse interface card in slot 4, and a disk controller card in slot 6. It also comes with a built-in disk drive (Fig. 2-5) and an enhanced microprocessor which can respond to extra commands, although it recognizes all the commands which apply to the microprocessor in the Apple II, II+, and *IIfx*. Because the Apple *IIfx* is a closed system, the 16-pin game I/O connector is not available; only the 9-pin connector is. Finally, the cassette I/O ports are lacking in the Apple *IIfx*.



Fig. 2-3. Apple *IIfx* is the newest addition to the Apple II family (courtesy of Apple Computer, Inc.)

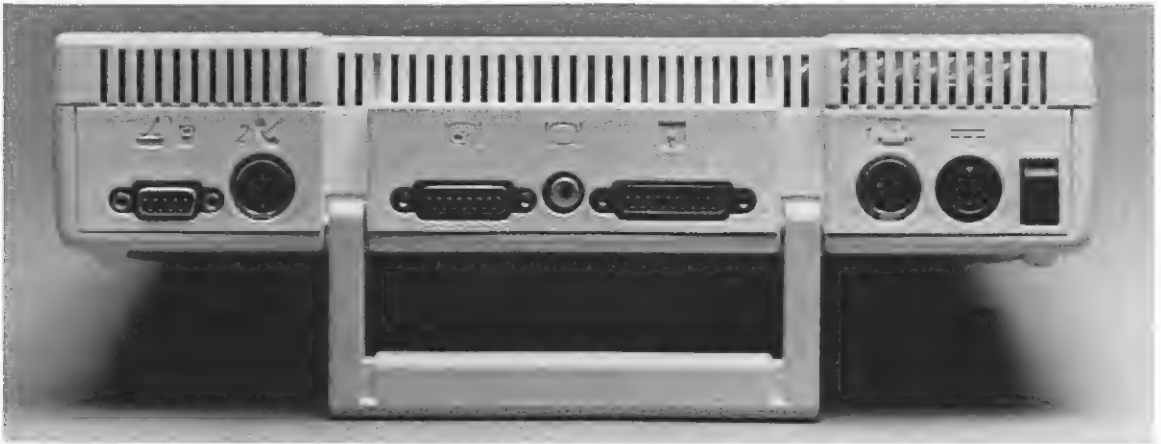


Fig. 2-4. The Apple IIc has seven built-in expansion ports (courtesy of Apple Computer, Inc.).

As a result of the changes made by the Apple IIc, some of the hardware devices made for the Apple II family were changed or are no longer needed for the IIc. Others are not usable by Apple IIc owners. Apple IIc owners must use a printer with a serial interface, or they must purchase a serial-to-parallel converter device. Chapters 5 and 6 discuss printers and describe which require a serial interface and which require a parallel interface. Chapter 7 describes serial-to-parallel converters.

Apple IIc owners cannot use a serial or parallel interface card because their



Fig. 2-5. The Apple IIc has a built-in, single-sided disk drive (courtesy of Apple Computer, Inc.).

system already contains the equivalent of two built-in serial interface cards. Chapter 7 discusses serial and parallel interfaces.

Apple *IIC* owners can use an *external modem*; that is, a modem that requires connection to a serial interface. They cannot, however, use a modem which is designed to be plugged into an expansion slot in the Apple motherboard. This distinction should be kept in mind when reading Chapter 8, which discusses modems.

## PERIPHERALS

There are two types of RGB interfaces discussed in Chapter 9. RGB interfaces which plug into a slot in the Apple motherboard can be used on the Apple II, II+, and *IIE*, unless otherwise indicated. RGB interfaces which plug into the special RGB port on the Apple *IIC* can only be used on the *IIC*.

There are two types of 80-column display cards discussed in Chapter 11. Neither can be used by the Apple *IIC*; both can, however, be used by the Apple *IIE*. Only those which do not use the *IIE*'s auxiliary slot can be used by the Apple II and II+.

Disk drives, discussed in Chapter 12, can usually be used by any member of the Apple II family; however, a different plug is required for connecting the drive to the Apple *IIC* than to the Apple II, II+, or *IIE*. Some converting cables are available, although they only work with fairly standard Apple drives or look-alikes. Disk controller cards, also discussed in Chapter 12, only work on the Apple II, II+, and *IIE*.

Hard disks and local area networks, discussed in Chapter 13, only work on the Apple II, II+, and *IIE*. The one exception is the QC-10, which also works on the *IIC*. Some hard disks may work only on the *IIE* and not the II or II+.

RAM cards, discussed in Chapter 14, do not work on the Apple *IIC*. Some RAM cards made for the Apple II and II+ may not work on the Apple *IIE*, particularly those which must be strapped to a socket on the Apple motherboard.

Clocks, discussed in Chapter 15, do not work on the Apple *IIC*. There is, however, no theoretical impediment to designing a clock peripheral which would use one of the serial ports on the Apple *IIC*. In fact, one of the sound devices for the Apple *IIC*, discussed in Chapter 16, also has a clock built into it.

Sound devices, discussed in Chapter 16, are of two kinds. Some plug into a slot on the Apple motherboard. These devices only work on the Apple II, II+, and *IIE*. Other devices plug into a DB-5 serial connector. They only work on the Apple *IIC*.

Pointers, discussed in Chapter 17, vary tremendously in the machines on which they function. Some plug into motherboard slots and thus only work on the Apple II, II+, and *IIE*. Others plug into the 16-pin game I/O port and thus also only work on the Apple II, II+, and *IIE*. Others plug into the 9-pin game I/O port and thus only work on the Apple *IIE* and *IIC*. Still others plug into the DIN-5 serial port and thus only work on the Apple *IIC*.

Keyboards, discussed in Chapter 18, generally work only on the Apple II, II+, and *IIE*. An exception is the Keyport 717, which plugs into the 9-pin game I/O port. Some of the keyboards are designed only for the Apple II and II+, particularly those which provide upper- and lowercase capabilities. Others are designed specially for the Apple *IIE*, notably a few keypads.

Z-80 cards, discussed in Chapter 19, work only with the Apple II, II+, and *IIE*.

**Table 2-1. Characteristics of the Apple II Family of Computers.**

<b>Characteristics</b>	<b>Apple II, II +</b>	<b>Apple IIe</b>	<b>Apple IIc</b>
Random access memory	4K to 48K expandable to 64K	64K expandable to 128K	128K
Read Only Memory	12K	16K	16K
Applesoft in ROM	II—No, II + —Yes	Yes	Yes
Autostart ROM	II—No, II + —Yes	Yes	Yes
Monitor program in ROM	Yes	YES	Yes
Processor	6502	6502A	65C02
Built-in self test	No	Yes	No
Runs at 1 mHz	Yes	Yes	Yes
Keyboard keys	52	63	63
Auto repeat keys	No	Yes	Yes
Open/closed Apple keys	No	Yes	Yes
Upper/lowercase keyboard built-in	No	Yes	Yes
Expansion slots	Yes	Yes	No
Standard Apple II family slot conventions	Yes	Yes	Yes
Serial ports built-in	No	No	Yes (2)
80-column display slot	Yes	Yes	No (built-in)
80-column display built-in	No	No	Yes
Port for mouse built-in	No	No	Yes
Plug-in mouse controller card	Yes	Yes	No (built-in)
Plug-in disk controller	Yes	Yes	No (built-in)
1 chip internal disk controller	No	No	Yes
Built-in disk drive	No	No	Yes
More than 2 drives	Yes	Yes	No (1 built-in, 1 external optional)
Profile hard disk support	II—No, II + —Yes (w/64K)	Yes	No
Uses Apple II and II + joysticks	Yes	Yes	No
Uses Apple IIe joystick	No	Yes	Yes
Built-in RGB circuits	No	No	Yes
RGB accessible from plug-in board	Yes	Yes	No (built-in)

There is no Z-80 device currently made for the IIc. A few of the cards come in separate IIe and II/II + versions; one comes for the IIe only and plugs into the auxiliary slot.

Table 2-1 summarizes the differences between the members of the Apple II family.



# Chapter 3



## Apple Hardware Shopper's Guide

In addition to deciding which peripherals to buy, you also need to give some thought to where and how to purchase the equipment. There are at least four major alternatives. The most obvious and simple alternative is to go to a local computer retail store and purchase the item you want. Even within this area, there is a substantial amount of variability in prices and service. There are discount stores, sales, etc. Another alternative is to order expansion products from a mail-order source where prices can be substantially lower than a retail outlet. Additionally, computer fairs often offer an unusual opportunity to do comparison shopping and purchase items at substantial discounts. Finally, you can find used equipment through the want ads, user groups, etc.

### **SMART SHOPPING AT RETAIL STORES**

Shopping at local retail outlets is perhaps the simplest and most common way of purchasing expansion products. There is substantial variability in retail prices of expansion products at these outlets, which may or may not be related to the levels of service they can offer. If a device has good documentation, good vendor support, and is relatively easy to install, support from the retail organization may not be critical.

An important factor is your own level of familiarity with electronic devices and of the Apple computer. If you are not technically inclined, it may well be worth the extra price to purchase from a specialty store which can show you how to install and use the device. On the other hand, if you are relatively familiar with the Apple and expansion devices for it, you will probably want to get the very best price you

can and count on getting any support you need directly from the vendor. If you plan to mix Apple and non-Apple expansion products and want high-quality support, your best plan would be to find a full-service dealer who offers both the Apple and non-Apple products you want.

In addition to variability in prices from one store to another, many stores have occasional sales where they will mark down prices significantly, sometimes by as much as 40 percent or more. In many cases, sales personnel at these stores are willing to give you some information as to the frequency of their sales and any sales coming up in the near future that might include products in which you are interested. It may be worth waiting to make your purchase at the sale price, or you may be able to convince the salesperson to give you the sales price now.

Keep in mind also that while there are often suggested retail prices for various products, sales people and store management nearly always have some flexibility on price. If you were making a major purchase, such as a printer or disk drive, etc., it may well be worth your while to negotiate the price, to make an offer less than the store's asking price. While some stores will indignantly refuse to consider such an offer, others may very well agree to a negotiated price lower than their standard asking price. In other cases, while the store may be inflexible on price for a particular product, they may be willing to throw in a box of paper, a box of disks or some other item that you would otherwise have had to purchase. This "sweetening the deal" may make it possible for you to get what amounts to a discount on the product without them bending their rules on the pricing.

If you are an employee at a large company which purchases a lot of computers, look into any company discounts you may be entitled to. Check with the purchasing department; sometimes companies establish a good rapport with local retailers, passing along any price breaks to employees. Quite often, a company will buy more computer systems than it needs, selling the excess to its employees at reduced prices. You may also be eligible for discounts through a users group, club, or even a college or university you may attend.

A factor to be considered in pricing is the degree to which the vendor can support you. The personnel at some computer specialty stores may be able to give you some advice. They may, however, be unable to assist you, particularly with lesser known devices. The last resort for support concerning devices is the manufacturer or vendor of the product themselves.

## **SMART MAIL-ORDER SHOPPING**

An alternative to shopping in retail stores is to examine the mail-order advertisements in the various computer magazines, available at newsstands or by subscription. Mail-order prices are typically much lower than standard retail prices. Some mail-order houses have acquired an excellent reputation for prompt delivery, and in many cases, even for providing excellent support by telephone. Examining the ads will make it clear to you what support features they have to offer. If you are at the point of making a purchase, you can call the vendor concerning the product and inquire about their support policies.

Keep in mind, though, that some purchasers have had difficulties with mail-order sources. Products have sometimes been delivered after long delays or never delivered

at all. Incorrect products have been delivered, etc. The best way to find out about a particular mail-order organization is to talk with other Apple users who have made purchases from them.

We have chosen not to report on the reputations of specific mail-order vendors because it is subject to rapid change through time. A vendor which has an excellent reputation at one moment may encounter some difficulties, or a vendor who has a good reputation in one area may have a different reputation in another part of the country. We caution you to check with local computer users about their experience with particular mail-order vendors.

There are a few particular steps you can take to help protect yourself. Wherever possible, use a charge card in making purchases. Mail-order purchases made by charge card provide you with some additional protection if merchandise is never delivered or is faulty in some way when delivered. This protection varies from one state to another. You may need to consult the agency that issued your credit card in order to learn exactly what your rights as a credit card purchaser are.

We would like to emphasize that while there are potential difficulties with purchasing items by mail order, there are also many advantages. Many of the devices we use in our personal Apple systems were purchased by mail order, and we have often been delighted with the delivery, service, and prices offered by mail-order firms.

### **SMART SHOPPING AT COMPUTER FAIRS**

A third way of purchasing expansion products is to visit a computer fair. There are many different types of computer fairs. Look particularly at the consumer fairs.

Watch the calendar of events in general personal computer magazines such as *Byte* and *Infoworld* for announcements of these computer fairs. Consumer-oriented fairs are often attended by mail-order firms who make direct, over-the-counter sales at mail-order prices, giving you the advantage of getting your equipment immediately. You can make certain you are getting the correct items, and you have the opportunity to look at the exact item you are purchasing and ask questions about the products and the support offered by the mail-order house before you make the purchase. Computer fairs offer an extraordinary opportunity to do comparison shopping. Various competitive products are often all available for inspection on working computer systems. You can also compare vendors for price and support.

Pricing at computer fairs is significantly discounted from standard retail prices. There may be some flexibility for bargaining, particularly on the very last day of the fair. In the closing few hours of the fair, many vendors will offer extraordinary bargains on unsold products. This is one area of special bargains that you can look out for.

### **SMART SHOPPING FOR USED EQUIPMENT**

Another way of acquiring equipment is to look for used equipment, which is often advertised in the want ads of local papers, in computer specialty newsletters which circulate in many areas of the country, in club newsletters, or at the meetings of various users groups. There may also be computer swap meets in your area. In-

dividuals can ring used equipment to these meets to be offered for sale to the attendees.

There are obviously special precautions to be taken in buying used equipment. Unless you know the seller personally, it would be unwise to purchase any peripheral equipment without seeing it actually function correctly. Even then it would be wise to insist on a written warranty of at least one week. It is altogether possible that a device may function correctly during a brief test, but fail in some other situation or type of use, or after some period of use. If you buy used equipment at a swap meet, be sure to obtain the seller's name, address, and phone number so you can contact him if any problems arise.

If you do purchase a piece of used equipment, try it extensively in the kinds of applications you will be using it for during the period it has been warranted; return it if any problems arise. It is also desirable to pay by check for any used equipment. In the event of a dispute arising over the servicing of the equipment, you have the option of stopping payment on the check as a way of acquiring some leverage in the negotiations over the sale of the equipment. It would be wise to check on the legality of this measure in your particular state, since the laws are different from one state to another.

There are several factors you should keep in mind when buying used equipment. They will help you decide whether or not the price is reasonable. First, many devices have moving parts and have a finite working life. If a printer has printed many thousands of pages, some part of its useful life has been used up. This should be taken into account in its pricing. Similar considerations apply to all other devices that are subject to wear and tear. Additionally, you should be sure that you are getting all of the components that come with the new equipment, especially the documentation. Attempting to use a piece of equipment without the documentation is frustrating. While it may be possible to secure a copy of the documentation from the manufacturer, this process may take a long time. It may not even be possible, based on the manufacturer's policy or the discontinuation of particular products or versions of products.

Whatever avenue you choose for purchasing expansion hardware, it will be useful to you to have background information about the particular product. The introductions to each chapter are intended to give you the necessary background to make an informed and intelligent purchase, whether you buy from a retail store, by mail order, at a computer fair, or from another user.

# Chapter 4



## Methods of Evaluation and the Selection Process

The following chapters provide you with a complete guide to peripherals for the Apple II, II+, IIe, and IIc. Each chapter is devoted to one type of hardware device and consists of four sections:

- ☐ Background information
- ☐ Reviews of available products
- ☐ Worksheet for reviewing additional products
- ☐ Comparative table of ratings and features

The main focus is on the five major peripherals of interest to Apple users: interfaces, printers, disk drives, monitors, and modems. Other devices are also reviewed in separate chapters.

### BACKGROUND INFORMATION

The first step toward making an intelligent choice of a peripheral is to have a general understanding about it. Each of the following chapters opens with a tutorial on one type of device to give you the background information and understanding you need to digest the reviews which follow. It also allows you to find the best value for your particular peripheral needs. We have tried to provide you with a "short course" in the nature, function, and value of each major type of peripheral.

### THE REVIEWS: METHODS OF EVALUATION

We have used a combination of methods in evaluating and reviewing the various

hardware expansion products for the Apple II family. While the main part of our evaluation has always been first-hand use of the products described, we have not felt this was adequate. In spending a few hours using and testing a piece of hardware, it is altogether possible that either major advantages or disadvantages of the product will be overlooked. Many such advantages or disadvantages would show up only with extended use in a broad variety of situations. Because of this problem, we have used information from a number of other sources.

Wherever an article written by another reviewer exists, we have read their comments and verified any points they have made concerning strengths and weaknesses of the products. We have also relied very heavily on informal reports provided by our associates who have used the products over long periods of time. While these Apple users did not write reviews of the products, they did supply us with their experiences as to the strengths, weaknesses, and features of the products. Our final reviews are a combination of tests of the products by members of our review team, information collected from other reviews and the manufacturer's literature, and interviews of long-term and intensive users of the products wherever possible.

## **A TO D RATING SYSTEM AND LIST OF FEATURES**

We have rated most of the products on the same criteria. Some differences in criteria for some types of expansion devices were required to provide an accurate evaluation of the product's worth. In addition, we have provided a consistent list of features for each of the types of products for comparative purposes. The criteria were evaluated on the basis of written definitions, and the ratings are on an A through D scale. The *A* rating was given only to products which were truly outstanding on a criteria. *B* indicates excellent performance without serious flaws. *C* indicates that there are at least a few weaknesses in this area. *D* means the product was unacceptable for some reason in this particular criterion.

## **SELECTION OF PRODUCTS FOR REVIEW**

Many products were not reviewed because they were not available to us or because we felt that either their price or performance did not make them significant candidates for purchase. It is also possible that we may not have been aware of the existence of some products not advertised in major computer publications.

We have reviewed most of the products that will be frequently encountered in retail outlets or in advertisements from the manufacturers and other vendors in the popular magazines. It is quite possible that some item you are familiar with is not found in this book. Because the market is changing so rapidly, we have chosen to discuss only those products that are easily available and have an established user base.

In this book we have taken advantage of the large amount of products available to create a real cross section of prices and functions. A list of criteria has been established and applied to every device reviewed. It will allow you to realistically find out how a product compares to its competition. At the end of each chapter, we have provided a summarized comparison chart including the devices we have reviewed. An explanation of the ratings follows.

## The Five Criteria Used in Evaluating Products

The overall rating indicates the review team's general impression of the quality and performance of the device when all factors were taken into consideration. This rating includes quality, price/performance, support, documentation, ease of installation, and any special characteristics that might not have been otherwise rated.

The *price/performance rating* indicates how much performance you are getting for your dollar. An especially cheap peripheral might receive an A price/performance rating, even though its overall rating might only be a B. This indicates that while it is by no means outstanding among products of its type, it is an outstanding bargain at its price.

*Ease of installation* refers to the simplicity with which the device can be attached to and used with the Apple. An A rating would apply to a device which attaches in an extremely simple and straightforward way to an Apple and is also convenient to operate once it is installed. Programs that require complex assembly steps and/or multiple switch settings would receive a lower rating. A rating of D would ordinarily indicate that some fabrication steps, such as soldering, adjustment of parts, or acquisition of parts not supplied with the device were required in order to make it work.

The *documentation rating* reflects documentation supplied by the vendor in terms of its completeness, comprehensibility, and the degree to which it enables an untrained user to efficiently use the device.

*Vendor support* reflects warranty terms; availability of technical support, whether from retailers or directly from the manufacturer; and service availability, both within and beyond the warranty period.

In a few cases an additional criteria relevant to only one type of product has been added to the standard list of rating criteria. For example, the software compatibility of an expansion board is a significant determinant of the usefulness of the product. *Software compatibility* is used in this case as a criterion for rating.

## Structure of the Reviews

Within a review itself, the product summary gives a description of a product and its general features. Price/performance may be mentioned here to give you a general idea of the value of the product. We may also discuss how easy or difficult it is to integrate the device with your existing system.

We will designate the general quality of the device and how it performs in terms of speed, durability, software compatibility, etc. High-quality features are mentioned, as well as any problems or disadvantages. The overall usefulness and the best possible application of the product may also be described.

The *vendor support rating* is often supplemented by stating warranty terms, technical support, and any other relevant information about the ease of receiving answers to questions or help with problems.

Within any particular product some additional sections may cover topics of interest to that product only. For example, for printers we cover features for word processing and features for graphics.

## **Groups of Related Products**

Often a family of related products differ only in one or two particulars. An example is printers, where two or more models often differ only in the width of the paper carriage and in price. All other specifications tend to be identical. In such cases we have covered the group of related products in a single review. In the comparative tables at the end of each chapter, however, each product is listed separately. The reviews are in alphabetical order by product name.

## **WORKSHEET FOR REVIEWING ADDITIONAL PRODUCTS**

New expansion products for the Apple appear each month. A new product could represent a better price/performance value than any of the products reviewed in this book, or it may be overpriced. We have provided a blank review form in each chapter to allow you to organize information about a new product for easy comparison to the products reviewed in the book, or it may be overpriced. We have provided a blank review form in each chapter to allow you to organize information about a new product for easy comparison to the products reviewed in the book. This form will make it easy for you to include new expansion products in your search for the best values for your growing computer system.

## **COMPARATIVE TABLES OF RATINGS AND FEATURES**

It is often difficult to keep the ratings and features of a number of products in mind for comparison. We have, therefore, provided a comparative table of the ratings and features of all products in a chapter to allow you to quickly compare various devices. You may easily eliminate those that do not have features you need or that are rated as inferior.

## **THE HARDWARE SELECTION PROCESS**

Selecting hardware is one of your most important undertakings as an Apple owner. Your computer can do marvelous things with good expansion hardware. Without good expansion products, however, it is very limited. Three fundamental assumptions underlie our discussion of hardware selection:

- ☐ You have a goal in mind that you expect the hardware and your Apple to help you accomplish.
- ☐ Your time is limited and valuable.
- ☐ You have a limited budget for computer hardware.

These assumptions will not apply to everyone. If you are a computer hobbyist, you may enjoy spending 10 hours reading, researching, and keeping careful notes on dozens of hardware devices. Perhaps you can afford to buy hundreds or thousands of dollars worth of hardware to compare. If, however, you are like most Apple users, your time and budget are limited. You will need to conduct a systematic and efficient survey to quickly find a device that will serve your ultimate purpose at a reasonable price. Your time will then be spent learning to use this device and accomplishing your larger goals.



An excellent way to start your search for a suitable device is to separate the features for the type of device, as listed in the review section of this book, into three groups, based on your particular objectives in using the device:

- ☐ Features required to achieve your goals
- ☐ Features which might be useful but are not required
- ☐ Features which would be a nuisance or dangerous (i.e., exposed electrical components)

Once you have sorted the features in this way, you can quickly eliminate those devices which lack essential features or contain objectionable features with the aid of the comparison chart at the end of the chapter. A few devices should survive this first cut.

From among the survivors, pick the ones that have the highest ratings and the most features. Read the detailed descriptions of them and select a small number which you can realistically expect to examine in detail. You may want to write to the manufacturers of these devices for more detailed data. With some perseverance, you may be able to try out all of these devices at a retail store and make your final decision based on the firsthand use of the device. You may also want to compare notes with the other users of the final contenders.

We trust that you will find the following chapters useful to you in acquiring a general orientation and overview of a particular kind of product, an evaluative review of each product, and a comparative presentation of the various products of a given type.

# Chapter 5



## Dot-Matrix Printers

Today there are over 200 printers from which to choose. They may be divided into two major categories: dot-matrix and fully-formed-character printers. The dot-matrix printer produces a pattern of dots which approximate the shape of a letter. This chapter reviews a variety of dot-matrix printers. The best of these printers, such as the Apple Imagewriter and Epson LQ-1500, use a large number of very closely spaced dots to produce characters which look very much like the characters printed by a typewriter. You may find the output from such printers acceptable for formal business letters.

Fully-formed-character printers, covered in Chapter 6 produce characters similar to those produced by a typewriter. While the mechanism may be different (as in the H-P Laser jet printer), the appearance of the characters is the familiar, solid form produced by standard typewriters.

### CHARACTERS

The standard pitch for a printer is 10 characters per inch (CPI). Some printers have control codes which allow you to change this pitch to suit your needs.

Most printers have a standard set of 96 ASCII characters, which contains the letters of the alphabet, numbers, punctuation marks, and symbols. Some printers feature additional character sets for italic characters, block graphic characters, scientific characters, and foreign language characters. Proportional character sets space characters based on their size. Because I is smaller than M, it takes up less space.

## **RIBBONS**

Printers will use cloth or mylar ribbons which come in cartridges or on standard typewriter spools. Cloth ribbons can be used until they need to be replaced or reinked. Mylar or carbon ribbons can only be used once, and though the print quality is better, it is more expensive to use and not practical for draft copies.

## **PAPER**

The type of paper you use will depend on the type of printer and its capacity for handling paper. Thermal printers can only use thermal paper, which is chemically treated and heat-sensitive. If your printer has pin feed, you may use sprocket paper (holes on the sides), which comes in rolls or fanfold. Single sheets or rolls of paper are used with friction-feed printers, which accept the paper just like a typewriter. Because there are different qualities of paper, use lightweight paper for your drafts and heavier paper for final presentations. For important printouts, "perforationless" fanfold paper can be purchased at a substantially higher price than normal printer paper. It combines the ease of fanfold paper with the smooth edges of single sheets.

## **BUFFERS**

A *buffer* is a storage area consisting of RAM chips. The amount of storage space depends on the printer and its capacity. The buffer stores each character sequentially, sent by the computer, and allows the computer to continue operating while the printer is printing at its slower pace, thus saving time.

Buffers can be built in to the printer or added to the system as a separate component. Another possibility is to use part of the Apple's RAM memory to act as a printer buffer. This choice requires special software but no additional hardware.

## **INTERFACES**

Computers use an interface to connect the computer to the printer to allow the printer to use a particular standard. There are industry standards for interfaces which allow you to connect almost any computer to any printer. They specify how to transfer information as well as what type of cable and plug is needed for connection.

The most common data format used in the industry for character and command representation is ASCII (American Standard Code for Information Interchange). The two hardware standards are the RS-232C (a serial-format transmission), and the Centronics-type (a parallel transmission).

Standards are also used for the handshaking signals and for formatting the transmitted data. Together, they are called the *protocol*. In order for two machines made by different manufacturers to work together, they must have the same protocol.

The RS-232C serial interface designates the specific voltage levels, the required driver, and the receiver characters for 21 circuits. Information moves sequentially, bit by bit, between the computer and the printer, making it usually slower than a parallel interface. The connection involves 25 different wires, each having a defined use, but not all 25 are needed. With this particular standard, some of the

parameters, such as baud rate, must be set by the software.

The parallel, Centronics-type interface uses 36 different wires, which send eight-bit bytes of information simultaneously. It is much quicker than the serial interface. The other wires are used for the handshaking signals. Centronics is a printer manufacturer and was an early user of the parallel transmission; hence, its name has been given to the protocol.

The Apple II, II+, and IIe will require an appropriate interface card for any printer, parallel or serial. The Apple IIc has a built-in interface for a serial printer. To use a parallel printer with the IIc, you will need a serial-to-parallel converter.

## **FUNCTION AND USE**

A printer accepts electrical charges sent by the computer in the form of binary numbers, which represent the keyboard characters and some commands. These electrical charges are then translated into understandable print.

In addition to characters, a printer must translate commands, such as print modes (normal, condensed, enlarged, double-strike), print functions (underline, superscript, subscript), print action (carriage return, line feed, vertical tab), and paper formatting (line spacing, form length, margins). These functions use an assigned number or numbers, called *escape sequences*, to identify them to the printer. These escape sequences are not universal, and you must check your printer manual for each particular function.

## **SETTING UP A WORD PROCESSOR**

An alternate way of establishing contact between the computer and printer is through a word processor, which addresses the printer. There is a variety of commercially available word processing software from which you can choose.

The first step is to configure your word processor to the printer. The program may ask you the type of printer you are using. In some cases you will be presented with a list of commonly used printers from which to choose. Other programs have a list of printer variables that you will have to manually define. After you have answered these questions, the program takes over and initiates the routines needed by the computer.

Characters are typed on the keyboard and presented on the screen for editing. When the work is complete, a simple one-letter command will print the material. In some cases, features like emphasizing or underlining will require special handling and use of the function keys from the keyboard. The printed output will go to the printer (serial or parallel) you specified when you configured the word processor.

## **DOT-MATRIX PRINTERS**

There are many different ways to group or classify printers. The classifications most frequently used distinguish printers that produce type like a typewriter's fully formed characters from those that simulate typewriter type with patterns of dots. The fully formed character printers are discussed further in Chapter 6. The remainder of this chapter is devoted to dot-matrix printers.

The dot-matrix printer forms characters by using a pattern of dots. This pattern is called the *matrix*, and the dots are made in a variety of ways. For instance, with an *impact printer*, a column of tiny hammers strikes the ribbon to form the character. Only those hammers needed to form the character actually strike the ribbon. With *ink-jet printers*, the ink is literally sprayed onto the paper through a configuration of channels. These channels are quiet, fast, and can more easily use colors. *Thermal printers* use heat to darken specially treated paper. Because there is no impact made with thermal printers they are much quieter; however, the thermal paper is expensive. *Laser printers* burn the characters into the paper. They represent the state of the art and are very expensive. *Line printers* are extremely fast; printing an entire line at one time. Complete sets of characters are contained on bands of rotating drums which pass above the paper. Each column has an independent hammer which strikes the paper, which in turn strikes the character in front.

Impact dot-matrix and thermal printers form the characters progressively, rather than all at once, and the quality of the character depends upon the size of the matrix. Most printers will use a matrix of 9 dots across and 9 dots down ( $9 \times 9$ ), although a larger matrix ( $10 \times 10$ ,  $12 \times 12$ , or  $14 \times 14$ ) is available with some models. The size and style of the characters can be altered through software control. When the matrix size is smaller than  $8 \times 18$ , you start losing quality and the lower portion of characters with descenders are squeezed above the line instead of below.

Some dot-matrix printers improve the print quality with additional modes of operation. In the *emphasized mode*, characters are printed once, and then again slightly to the side, filling in the spaces between the first set of dots to emphasize the character. In the *overstrike mode*, characters are also printed twice, one line at a time. Both of these modes slow down the printer.

A few of the dot-matrix printers we reviewed feature a *correspondence mode*, which is an attempt to create letter-quality printing using dots. Again, it is slower than the standard mode.

Printer speed can be very important for some applications. The fastest dot-matrix printers are in the range of 400 to 300 characters per second (cps) in the standard mode, which is extremely fast compared to the much slower fully formed character printers. When using some of the modes, however, the speed is reduced by almost half.

Another factor in determining speed is whether the print head moves bidirectionally or unidirectionally. Bidirectional printing is much faster because printing starts from the left margin, goes to the right margin, and from there prints back to the left margin.

Dot-matrix printers are capable of producing graphic images with the curves and lines formed with the dots. Using a high-resolution mode, even more graphics can be created. Most of the printers we reviewed will create graphs and charts which are useful in reports and other presentations.

## Alphacom 81

\$169.95

Alphacom

### RATINGS

- B Overall rating
- A Price/performance
- B Software compatibility
- A Ease of installation
- C Documentation
- B Vendor support

### FEATURES

Type:	Thermal
Matrix size:	8 × 8
Descenders:	—
Speed:	80 cps
Bidirectional:	+
Logic-seeking:	—
Correspondence	
Speed:	—
Matrix size:	—
Dot graphics:	80 dpi
Print:	
Expanded:	+
Compressed:	—
Emphasized:	—
Centronics	
parallel:	+
Serial:	—
Friction feed:	+
Pin feed:	—
Characters per	
line:	80
Paper size:	8"
Paper type:	Thermal

### PRODUCT SUMMARY

The Alphacom 81 offers a low-cost solution for printing data in an 80-column format on the Apple. It prints at a medium speed of 80 cps bidirectionally, but lacks the logic-seeking feature. Because it will print only on special heat-sensitive paper, it will not be possible to use high-quality or preprinted paper. The characters are formed in an 8-×-8 matrix, and they lack true descenders.

### FEATURES FOR WORD PROCESSING

The Alphacom 81 offers some of the features frequently used in word processing applications. Expanded print, underlining, and reverse printing are supported. Most word processors will work if you stick to the features that the printer supports.

### FEATURES FOR GRAPHICS

The bit-mapped graphics allows you to produce graphic images under control of BASIC or other programs. The quality of the graphics produced is acceptable.

## INSTALLATION AND INTERFACING

This printer comes with a parallel interface.

## QUALITY AND PERFORMANCE

The Alphacom 81 is a good low-cost printer for programmers and other home computer users. The printer lacks some features that most serious word processing applications require. The quality of the produced text is not up to general dot-matrix standards, due to the thermal paper used, the lack of true descenders, and the size of the matrix. This printer is recommended for those of you who will not be preparing documents, and who want a very light-duty product.

## VENDOR SUPPORT

Alphacom provides a standard 90-day warranty. Technical assistance is available through an 800 number.

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### D-100

\$395.00

Smith-Corona

#### RATINGS

B Overall rating  
B Price/performance  
B Software compatibility  
B Ease of installation  
B Documentation  
B Vendor support

#### FEATURES

Type:	Impact
Matrix size:	9 × 9
Descenders:	+
Speed:	120 cps
Bidirectional:	+
Logic-seeking:	+
Correspondence:	
Speed:	-
Matrix size:	-
Dot graphics:	120 × 72 dpi
Print:	
Expanded:	+
Compressed:	+
Emphasized:	+
Centronics	
parallel:	+
Serial:	-
Friction feed:	+
Pin feed:	+
Characters per	
line:	80
Paper size:	to 11" wide
Paper type:	Standard

## PRODUCT SUMMARY

The Smith-Corona D-100 is a high-speed, 80-column, dot-matrix printer. It is bidirectional and logic-seeking. Friction feed and tractor feed are standard, allowing you to use single sheets or fanfold paper. This printer weighs only 18.7 pounds.

## FEATURES FOR WORD PROCESSING

The D-100 uses a 9- $\times$ -9 matrix in normal text mode and a 10- $\times$ -9 matrix in the emphasized and elongated modes. Character sets include the 96 ASCII characters, as well as italic and international character sets. Other features include: selection of pitch size (10, 12, and 16.7 cpi), emphasized, compressed, and expanded print, and vertical and horizontal tabs.

## FEATURES FOR GRAPHICS

Graphics can be created in three densities: 60  $\times$  72 dots per inch (dpi), 72  $\times$  72 dpi, and 120  $\times$  72 dpi. There are no block characters.

## INSTALLATION AND INTERFACING

The D-100 comes equipped with a Centronics-type parallel interface. The serial (RS-232C) interface is optional.

## QUALITY AND PERFORMANCE

This printer offers very good quality printing and is very reliable.

## VENDOR SUPPORT

There is a 90-day warranty on parts and labor. Technical support is available through a national service network and an 800 number.

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## D-200

\$595.00

Smith-Corona

### RATINGS

B Overall rating  
B Price/performance  
B Software compatibility  
B Ease of installation  
B Documentation  
B Vendor support

### FEATURES

Type:	Impact
Matrix size:	9 $\times$ 9
Descenders:	+
Speed:	120 cps
Bidirectional:	+
Logic-seeking:	+
Correspondence:	
Speed:	60 cps
Matrix size:	17 $\times$ 18
Dot graphics:	120 $\times$ 72 dpi



## FEATURES

Print:	
Expanded:	+
Compressed:	+
Emphasized:	+
Centronics	
parallel:	+
Serial:	+
Friction feed:	+
Pin feed:	+
Characters per	
line:	80
Paper size:	to 11" wide
Paper type:	Standard

## PRODUCT SUMMARY

This is a lightweight, bidirectional, logic-seeking printer featuring the Smith-Corona NLQ (near-letter-quality) mode. Friction feed and tractor feed are standard. The D-200 comes equipped with a 2K buffer to store data for input into the printer.

## FEATURES FOR WORD PROCESSING

For word processing applications, there is a character matrix of  $9 \times 9$  in normal text mode and  $17 \times 18$  in the correspondence, or NLQ, mode. There is a complete set of 96 ASCII characters and a set of international characters. Print modes include enlarged, compressed, emphasized, and italic. Print functions allow you to use superscript and subscript. Vertical and horizontal tabs are also included.

## FEATURES FOR GRAPHICS

Graphics can be created in three densities:  $60 \times 72$  dpi,  $72 \times 72$  dpi and  $120 \times 72$  dpi. There are no block-graphic characters included with this model.

## INSTALLATION AND INTERFACING

Both the serial (RS-232C) and the parallel (Centronics-type) interfaces are standards with the D-200 printer.

## QUALITY AND PERFORMANCE

Smith-Corona enjoys a wide reputation for outstanding quality and reliability. The NLQ mode print is very good for a printer in this price range. The D-200 is very quiet. The correspondence quality print is good, but will not pass for letter quality.

## VENDOR SUPPORT

There is a one-year warranty on Smith-Corona printers. Technical support is provided through a national service network, and there is an 800 number available.

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### D-300

\$795.00

Smith-Corona

#### RATINGS

B Overall rating  
B Price/performance  
B Software compatibility  
B Ease of installation  
B Documentation  
B Vendor support

#### FEATURES

Type:	Impact
Matrix size:	9 × 9
Descenders:	+
Speed:	140 cps
Bidirectional:	+
Logic-seeking:	+
Correspondence:	
Speed:	70
Matrix size:	17 × 18
Dot graphics:	120 × 72 dpi
Print:	
Expanded:	+
Compressed:	+
Emphasized:	+
Centronics	
parallel:	+
Serial:	+
Friction feed:	+
Pin feed:	+
Characters per line:	132
Paper size:	to 15" wide
Paper type:	Standard

#### PRODUCT SUMMARY

The D-300 is a bidirectional, logic-seeking printer. It features the 15-inch wide carriage. Friction feed and tractor feed are standard, and this printer features a 2K buffer for storage. It is a very quiet printer. The near-letter-quality print is not very convincing. Emphasized with near-letter-quality does a better job but is very slow.

#### FEATURES FOR WORD PROCESSING

For word processing applications, this printer uses a 9- × 9 matrix or 17 × 18 for the correspondence mode, referred to as NLQ. It uses the standard 96 ASCII

character set, as well as international characters. The special features include emphasized, italic, emphasize italic, enlarged, superscript, and subscript. Pitch can be set at 10, 12, or 16.7 cpi, as well as proportional. Two adjust buttons on the front panel allow you to reposition the paper in the printer. Either cut-sheet paper, fan-fold paper, or forms may be used.

## FEATURES FOR GRAPHICS

Although there are no block-graphic characters, dot graphics can be produced in three densities: 60 × 72 dpi, 72 × 72 dpi, and 120 × 72 dpi.

## INSTALLATION AND INTERFACING

The D-300 comes equipped with both parallel and serial interfaces.

## QUALITY AND PERFORMANCE

The manufacturer has a very good reputation for quality and reliability of its products.

## VENDOR SUPPORT

There is a 1-year warranty on the D-300. Technical support is available from a national service network and an 800 number.

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## Delta 10 and Delta 15

10—\$549.00

15—\$795.00

Star Micronics, Inc.

### RATINGS

B Overall rating  
A Price/performance  
B Software compatibility  
B Ease of installation  
A Documentation  
B Vendor support

### FEATURES

Type:	Impact
Matrix size:	9 × 9
Descenders:	+
Speed:	160 cps
Bidirectional:	+
Logic-seeking:	+
Correspondence:	
Speed:	—
Matrix size:	—
Dot graphics:	240 × 144 dpi
Print:	
Expanded:	+
Compressed:	+
Emphasized:	+
Centronics	
parallel:	+

## FEATURES

Serial:	+
Friction feed:	+
Pin feed:	+
Characters per line:	10—80, 96, 136 15—136, 164, 232
Paper size:	10"—15"
Paper type:	Standard

## PRODUCT SUMMARY

The Delta 10 and Delta 15 (15 1/2-inch carriage) are bidirectional, high-speed dot-matrix printers. They are considered Epson-compatible. Both models are logic-seeking and represent Star Micronics' attempt to compete with the Epson FX-80 and FX-100 printers. Unless otherwise noted, this review will deal specifically with the Delta 10 model. Rolls and single sheets of paper are inserted from the back and use the standard friction feed or tractor feed for the sprocket paper. The Delta 15 has an option for paper to be fed from the bottom.

## FEATURES FOR WORD PROCESSING

The Delta 10 uses a 9- $\times$ -9 matrix. Character sets include the 96 standard ASCII characters, 64 special characters, and 88 international characters for foreign language applications. Other features include a selection of fonts, (standard, italic, or foreign language characters), a selection of print pitches (pica, elite, condensed, or enlarged) and special print functions (superscript, subscript, underline, double-strike). An 8K buffer is available to download 96 special characters for any applications you may have.

## FEATURES FOR GRAPHICS

High-resolution graphics are created by sending bit-mapped pictures through software. A variety of modes and densities are available: 60  $\times$  72 low resolution, 120  $\times$  44 high resolution, or 240  $\times$  144 ultrahigh resolution. For creating block graphics, there are 32 graphic characters also available.

## INSTALLATION AND INTERFACING

Installation is relatively easy. The manufacturer has provided instructions which are both informative and understandable. The Delta 10 provides both serial and standard parallel interface connectors.

## QUALITY AND PERFORMANCE

The Delta 10 provides high-speed and very good-quality text. It also has an excellent capacity for graphics.

## **VENDOR SUPPORT**

There is a 1-year warranty on parts and labor. Technical support from local dealers is available.

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### **FX-80 and FX-100**

FX-80 —\$699.00

FX-100—\$895.00

Epson America, Inc.

#### **RATINGS**

A Overall rating  
B Price/performance  
A Software compatibility  
A Ease of installation  
A Documentation  
C Vendor support

#### **FEATURES**

Type:	Impact
Matrix size:	11 × 9
Descenders:	+
Speed:	160 cps
Bidirectional:	+
Logic-seeking:	+
Correspondence	
Speed:	—
Matrix size:	—
PET graphics:	—
Dot graphics:	240 × 144
Print:	
Expanded:	+
Compressed:	+
Emphasized:	+
Centronics	
parallel:	+
Serial:	—
Friction feed:	+
Pin feed:	+
Characters per	
line:	
FX-80	80,132
FX-100	136,233
Paper size:	8"-14"
Paper type:	Standard

#### **PRODUCT SUMMARY**

These printers are Epson's top of the line and state of the art. The FX-80 (Fig. 5-1) is 80 column in normal mode, bidirectional, and logic-seeking. A "quiet" mode for the office environment is on the market. An optional 15-inch wide carriage (Model FX-100) allows you to use 14-inch paper. Epson printers are well-known for their print quality and graphics capabilities.

#### **FEATURES FOR WORD PROCESSING**

For word processing applications, the FX-80 features an 11- × 9 matrix (character



Fig. 5-1. The Epson FX-80 is an excellent, heavy-duty printer for the Apple computer (courtesy of Epson America, Inc.).

matrix  $5 \times 7$ ), 96 standard and italic ASCII characters, and nine international character sets. There is a 2K buffer area for storing a maximum of 255 characters for special applications, a reverse line feed, and a proportional spacing mode.

Your program provides printer control codes and escape sequences allowing you to select print modes, including normal, condensed, enlarged, and double-strike. You can select the print function, such as underline, superscript, and subscript; the print action which includes the carriage return, line feed, and vertical tab; the paper formatting; line spacing; form length, and page width.

### **FEATURES FOR GRAPHICS**

There are two graphics modes available. The 8-pin bit-image mode features a range of dot densities from 480 dots per 8 inches (normal) to 1920 dots per 8 inches (quadruple). The 9-pin bit-image mode features two dot densities: normal and dual (960 dots per 8 inches). The brightness of the dots may be controlled by changing the dot densities within a picture. No graphics characters for block graphics are provided, since it is recommended you use the RAM for this data.

### **INSTALLATION AND INTERFACING**

A Centronics interface is standard. The serial interface is optional.

### **QUALITY AND PERFORMANCE**

The Epson printers are an excellent investment by virtue of their outstanding graphics and print quality. All the characters are well-formed. A feature on this printer allows you to tear off a page 1 inch from the last print position, reducing the waste that occurs when you must move the paper up a few inches before you tear it off. Still another feature eliminates the struggle to install the tractor unit when you want

to use fanfold paper. Instead you use a preinstalled pin-feed mechanism. The printer is noticeably quieter than other dot-matrix printers.

## **VENDOR SUPPORT**

These printers are known for their durability, and our experience with them has proven it. There is a 90-day warranty on parts and labor. Service and breakdown problems are usually handled by the authorized dealers who are trained to do so.

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## **Gemini 10X and Gemini 15X**

10X—\$399.00

Star Micronics, Inc.

15X—\$549.00

### **RATINGS**

B Overall rating  
A Price/performance  
B Software compatibility  
B Ease of installation  
A Documentation  
B Vendor support

### **FEATURES**

Type:	Impact
Matrix size:	9 × 9
Descenders:	+
Speed:	120 cps
Bidirectional:	+
Logic-seeking:	+
Correspondence:	
Speed:	—
Matrix size:	—
Dot graphics:	240 × 144 dpi
Print:	
Expanded:	+
Compressed:	+
Emphasized:	+
Centronics	
parallel:	+
Serial:	—
Friction feed:	+
Pin feed:	+
Characters per	
line:	
10X	80, 96, 136
15X	136, 164, 232
Paper size:	8"—15"
Paper type:	Roll or sheets

## **PRODUCT SUMMARY**

These two products have become very popular due to their low price, as well as their excellent quality. The only difference between the two models is the size

of the carriage. The Gemini 15X offers a 15.5-inch carriage for 136-column printouts at 10 cpi.

They are bidirectional and logic-seeking. Single sheets or rolls of paper use friction feed. Sprocket paper fed through the back uses the tractor feed. The 15X has bottom-feed capability. There is an 816-byte buffer, which can be expanded to 4K or 8K with RAM chips supplied by Star Micronics. The Gemini printers are Epson-compatible for graphics. This review will refer to the Gemini 10X unless specifically noted otherwise.

## **FEATURES FOR WORD PROCESSING**

For word processing applications, the Gemini 10X features a 9- $\times$ -9 matrix, 96 standard and italic ASCII characters, 64 special characters, 88 international characters for foreign language applications, and 96 special characters for any application.

Your program provides printer control codes and escape sequences to select print modes, including normal, condensed, enlarged and double-strike. You can select print functions, such as underline, superscript, and subscript; print action, which includes the carriage return, line feed, and vertical tab; the paper formatting; line spacing; form length, and page width.

## **FEATURES FOR GRAPHICS**

High-resolution graphics are created by sending bit-mapped pictures through your software. There are a number of graphics modes depending on your applications. Low-resolution dot density is 60  $\times$  72; high-resolution dot density is 120  $\times$  144, and ultrahigh-resolution dot density is 240  $\times$  144. Block graphics are created with 32 graphic characters.

## **INSTALLATION AND INTERFACING**

The Gemini 10X uses a standard parallel interface and is easy to install. Later models include informative and easy-to-understand instructions.

## **QUALITY AND PERFORMANCE**

There were a few items we discovered in testing. When you begin to print, the first character is often not printed clearly (some type of timing problem). Another problem is that the friction-feed mechanism does not work well with fanfold paper. The paper starts wandering toward the right margin. When you are printing over 10 pages, the tractor feed must be used and must be exactly aligned and adjusted for paper tension, or the paper will tear or jam.

The Gemini 10X is a good investment, producing very high-quality text and excellent graphics.

## **VENDOR SUPPORT**

There is a 1 year warranty on parts and labor. Technical support is provided by local dealers.



## Imagewriter

10" carriage—\$595.00

Apple Computer, Inc.

15" carriage—\$749.00

### RATINGS

A Overall rating  
B Price/performance  
A Software compatibility  
A Ease of installation  
A Documentation  
B Vendor support

### FEATURES

Type:	Impact
Matrix size:	7 × 9
Descenders:	+
Speed:	120 cps
Bidirectional:	+
Logic-seeking:	+
Correspondence:	
Speed:	120
Matrix size:	12 × 18
Dot graphics:	160 dpi
Print:	
Expanded:	+
Compressed:	+
Emphasized:	+
Centronics	
parallel:	—
Serial:	+
Friction feed:	+
Pin feed:	+
Characters per	
line:	136 (10")
Paper size:	10" or 15"
Paper type:	Standard

### PRODUCT SUMMARY

The Apple Imagewriter printer is a serial dot-matrix printer. It prints text at 120 characters per second, bidirectionally and with logic-seeking head placement.

The Imagewriter comes in two sizes. A standard model has a 10-inch wide carriage (Fig. 5-2), and there is also a model with a 15-inch-wide carriage (Fig. 5-3). It will handle both friction feed and continuous feed paper. The adjustable sprockets can handle paper from 4 1/2 inches to the width of the carriage.

### FEATURES FOR WORD PROCESSING

The Imagewriter has a variety of different pitches including 10, 12, and 16.5. There are seven different character styles and eight different sizes, including proportional spacing. You can also create custom character sets and download them into the memory of the printer. It works with nearly all Apple word processing software. It is the standard text printing device for much software distributed by Apple Computer, including the Appleworks program.

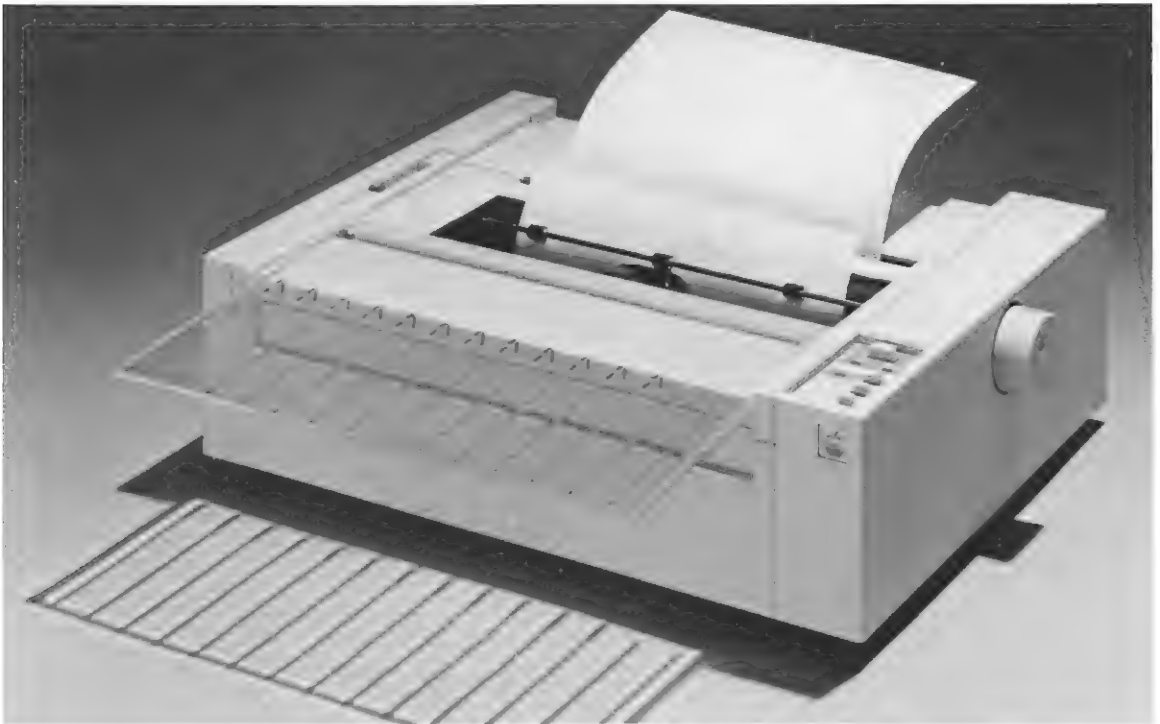


Fig. 5-2. Apple's Imagewriter dot-matrix printer will work with any Apple II computer (courtesy of Apple Computer, Inc.).

### **FEATURES FOR GRAPHICS**

Graphics are built into the Imagewriter. It can achieve a resolution of 160 dots per square inch across by 144 dots per square inch down. The Imagewriter is the

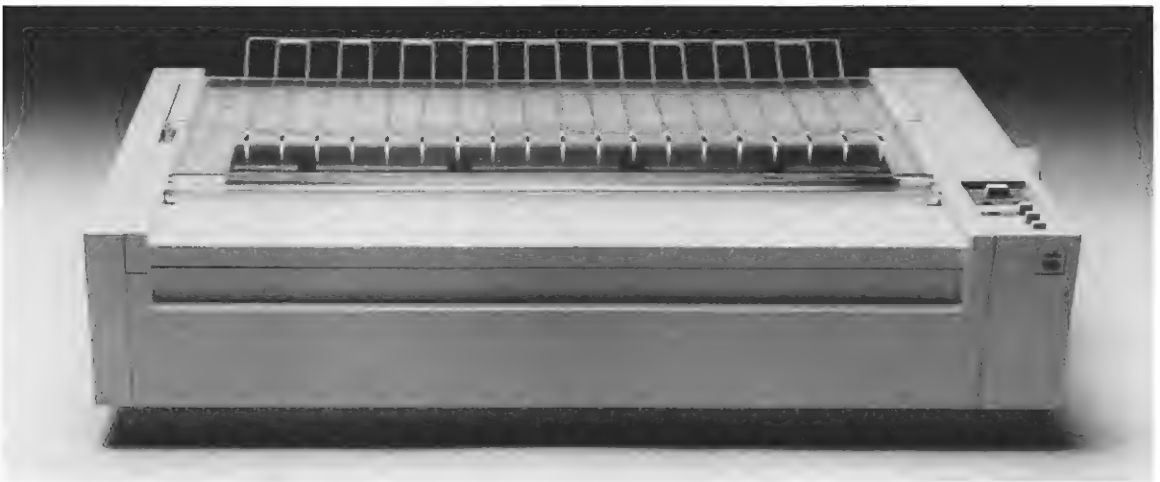


Fig. 5-3. The Imagewriter wide-carriage version is useful in business and graphics applications (courtesy of Apple Computer, Inc.).

standard graphics printing device specified by much of the software which is distributed by Apple Computer, Inc., including Mousepaint.

## INSTALLATION AND INTERFACING

The Imagewriter comes with a standard RS-232C serial interface and with appropriate cables for connecting it to an Apple *IIfx* or an Apple II, II+, or IIe with a Super Serial Card.

## QUALITY AND PERFORMANCE

The Imagewriter is a high-quality printer. It functions quite silently for a dot-matrix impact printer. Its text output is nearly indistinguishable from fully formed letter printers and offers the flexibility of multiple character sizes and fonts (lacking in most fully formed letter printers). The ease of interfacing the printer to many standard Apple programs adds to its appeal.

## VENDOR SUPPORT

The Imagewriter comes with a 90-day warranty. Service is available at Apple's extensive dealer service network.

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## LQ-1500

\$1395.00

Epson America, Inc.

### RATINGS

- A Overall rating
- B Price/performance
- A Software compatibility
- A Ease of installation
- A Documentation
- A Vendor support

### FEATURES

Type:	Impact
Matrix size:	9 × 17
Descenders:	+
Speed:	200 cps
Bidirectional:	+
Logic-seeking:	+
Correspondence:	
Speed:	67 cps
Matrix size:	37 × 17
Dot graphics:	+
Print:	
Expanded:	+
Compressed:	+
Emphasized:	+
Centronics	
parallel:	+
Serial:	-
Friction feed:	+
Pin feed:	-

## FEATURES

Characters per line:	136
Paper size:	to 16" wide
Paper type:	Standard

## PRODUCT SUMMARY

This is a high-speed new printer from Epson and offers many features. The LQ-1500 is the only dot-matrix printer in this price range that produces a correspondence quality print acceptable for letter-quality documents. It is bidirectional and logic-seeking. There is a 2K buffer for storage. Friction feed is standard, and an adjustable tractor is optional.

## FEATURES FOR WORD PROCESSING

For word processing applications, there is a 9- $\times$ -17 matrix, which expands to 37  $\times$  17. This printer uses the standard 96 ASCII character sets and includes 32 international characters and 96 italic characters. Features include 128 downloadable characters; vertical and horizontal incremental motion; proportional spacing; expanded, compressed, and emphasized print; double-strike; underlining; superscript and subscript, and automatic skip-over perforation. An automatic single-sheet paper guide saves you from having to feed sheets in one at a time. The near-letter-quality mode is very fast, and the print is very good.

## FEATURES FOR GRAPHICS

Block-graphic characters are not available; however dot graphics are produced with 10 different bit-image modes. The graphics matrix is variable in dot density.

## INSTALLATION AND INTERFACING

A Centronics-type parallel interface is standard. Serial and IEEE-488 parallel interfaces are optional.

## QUALITY AND PERFORMANCE

The correspondence mode allows you to print excellent near-letter-quality material.

## VENDOR SUPPORT

There is a 1-year warranty. Technical support is available from authorized dealers trained to handle your problems.

## **Microline 82A and 83A**

82A—\$349.00

Okidata

83A—\$749.00

### **RATINGS**

A Overall rating  
B Price/performance  
C Software compatibility  
A Ease of installation  
B Documentation  
A Vendor support

### **FEATURES**

Type:	Impact
Matrix size:	9 × 9
Descenders:	+
Speed:	120 cps
Bidirectional:	+
Logic-seeking:	+
Correspondence:	
Speed:	—
Matrix size:	—
Dot graphics:	60 × 66 dpi
Print:	
Expanded:	+
Compressed:	+
Emphasized:	+
Centronics	
parallel:	+
Serial:	+
Friction feed:	+
Pin feed:	+
Characters per	
line:	
82A	80, 96, 132
83A	136, 163, 224
Paper size:	
Sheets:	8 1/2"
Sprocket:	9 1/2"
Paper type:	Standard

### **PRODUCT SUMMARY**

The Microline 82A is a bidirectional, logic-seeking printer. The Microline 83A features a wide carriage, as well as the same facets as the 82A. Both friction-feed and pin-feed mechanisms are available with the printer, and tractor feed is an option. The paper feeds up through the bottom, or up the back. There is a tear bar so paper is torn off an inch from the printed line, saving paper from being wasted. The Okidata printers are not compatible with Epson and Gemini printers.

### **FEATURES FOR WORD PROCESSING**

For word processing applications, this printer features a 9- × -9 matrix and a complete set of 96 ASCII characters. Foreign language character sets are also available.

Using the printer control codes and escape sequences, you can use the special functions (enlarge, condense, and boldface) and control both the print action (carriage return, line feed, vertical tab) and the paper formatting (page width, line spacing, form length).

## FEATURES FOR GRAPHICS

The Microline 82A comes with 64 graphic characters for block graphics. The Okigraph I card is optional and can be installed for dot-addressable graphics which allow 60 × 66 dots per inch. Through appropriate DIP switch settings, 7- and 8-bit data is selectable. Many graphics programs offer special subroutines to allow them to be used with Okidata printers.

## INSTALLATION AND INTERFACING

This printer is relatively easy to install. It uses both a parallel interface (a Centronics-type connector) and a serial interface (an RS-232C connector). Another option available from Okidata is a high-speed serial interface, with up to 19.2K baud.

## QUALITY AND PERFORMANCE

The print quality is excellent, and the characters are fully formed. Many useful features are included: preinstalled pin-feed mechanism, paper tear bar, bottom and rear paper feed, and a front panel dial to set the form length. Some useful features, however, are lacking: dot-addressable graphics and italics, emphasize, and double-strike character fonts. It is very well-made and sturdy.

## VENDOR SUPPORT

There is a 90-day warranty on parts and labor. The print head is covered for 1 year. Technical support is provided by calling 1-800-OKIDATA.

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## Microline 84 Step 2

Parallel—\$1099.00

Okidata

Serial—\$1219.00

### RATINGS

B Overall rating  
B Price/performance  
C Software compatibility  
A Ease of installation  
B Documentation  
A Vendor support

### FEATURES

Type:	Impact
Matrix size:	9 × 9
Descenders:	+
Speed:	200 cps
Bidirectional:	+
Logic-seeking:	+
Correspondence:	
Speed:	50 cps
Matrix size:	13 × 17
Dot graphics:	103 × 72 dpi

## FEATURES

### Print:

Expanded:	+
Compressed:	+
Emphasized:	+

### Centronics

parallel:	+
Serial:	+
Friction feed:	+
Pin feed:	+
Characters per line:	136, 163, 231
Paper size:	
Sheets:	15"
Sprocket:	16"
Paper type:	Standard

## PRODUCT SUMMARY

This is a high-speed, wide-carriage printer. It features two modes; normal text and correspondence quality. In the text mode it is bidirectional and logic-seeking. Friction feed and tractor feed are standard with the Microline 84. Okidata printers are not compatible with Epson/Gemini printers.

## FEATURES FOR WORD PROCESSING

For word processing applications in the normal text mode, the character matrix is  $9 \times 9$ . In the correspondence mode, the matrix is  $13 \times 17$ . There is a complete set of 96 ASCII characters; foreign language character sets are available with the proper DIP switch settings.

With the printer control codes and escape sequences, you can select print modes (enlarged, condensed, double-strike, boldface), print functions (underline, superscript, subscript), print action (carriage return, line feed, vertical tab), or paper formatting (page width, line spacing, form length).

An optional feature for word processing applications is a cut-sheet feeder, which allows you to print letters without feeding each single sheet of paper into the printer. Many software programs offer special subroutines for use in word processing applications.

## FEATURES FOR GRAPHICS

The Microline 84 comes with dot-addressable graphics; 64 graphic characters are included for creating block graphics. To create high-resolution graphics, three dot densities are available:  $60 \times 72$  dpi,  $72 \times 72$  dpi, and  $103 \times 72$  dpi. You may also create your own characters for use in special applications in an  $11 \times 7$  matrix using the DLCG feature (Down-line Loaded Character Generator).

Because of its incompatibility with other printers, many graphics programs offer special subroutines for use with the Okidata printers.

## INSTALLATION AND INTERFACING

This printer is equipped with both parallel and serial interfaces. There is an optional high-speed (19.2K baud) interface available.

## QUALITY AND PERFORMANCE

This printer was reviewed for its very high speed. The printer falls below standard with the correspondence-quality mode. The Okidata 84, however, features very good print quality, and the characters are well-formed. There are a number of helpful features, including the tractor feed, bottom rear paper path, and front panel dial for setting form length.

## VENDOR SUPPORT

There is a 90-day warranty on parts and labor. The print head is covered for 1 year. Technical support is available by calling 1-800-OKIDATA.

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### Microline 92 and 93

ML92 Parallel—\$599.00  
Serial—\$698.00

Okidata

ML93 Parallel—\$899.00  
Serial—\$998.00

### RATINGS

B Overall rating  
B Price/performance  
C Software compatibility  
A Ease of installation  
B Documentation  
A Vendor support

### FEATURES

Type:	Impact
Matrix size:	9 × 9
Descenders:	+
Speed:	160 cps
Bidirectional:	+
Logic-seeking:	+
Correspondence:	
Speed:	40
Matrix size:	9 × 17
Dot graphics:	72 × 72 dpi
Print:	
Expanded:	+
Compressed:	+
Emphasized:	+
Centronics	
parallel:	+
Serial:	+
Friction feed:	+
Pin feed:	+
Characters per line:	ML92: 80, 96, 136



## FEATURES

	ML93: 136, 163, 233
Paper size:	10"—15"
Paper type:	Standard

### PRODUCT SUMMARY

The two models are identical, except the Microline 93 has a wide carriage. This printer features two modes: normal text and a correspondence-quality mode, and both are bidirectional and logic-seeking. Pin feed and friction feed are provided with the unit, and tractor feed is optional. Okidata printers are not compatible with Epson and Gemini printers; however, some software programs offer special subroutines for the Okidata printers.

### FEATURES FOR WORD PROCESSING

For word processing applications, the Microline 92 and 93 feature a 9- $\times$ -9 matrix, and a 9- $\times$ -17 matrix in the correspondence mode. There is a complete set of 96 ASCII characters. Foreign language character sets are available with the proper DIP switch settings. Italics are not available, however.

Using printer control codes and escape sequences, you can select print modes (normal, emphasized, enhanced, double-width, boldface), print functions (underline, superscript, subscript), print action (carriage return, line feed, vertical tab), and paper formatting (page width, line spacing, form length). In the correspondence mode, proportional spacing effects can be achieved by varying the spacing of the characters.

There is an optional cut-sheet feeder available which allows you to print letters without having to feed in single sheets one by one.

### FEATURES FOR GRAPHICS

The Microline 92 and 93 come with dot-addressable graphics. For high resolution, there are two dot densities: 60  $\times$  60 dpi and 72  $\times$  72 dpi. Graphics and text may be mixed on the same line when you use the "Start Graphics" and "End Graphics" sequences. There are no characters to create block graphics; however, there are up to 96 characters available for use in special applications. They are created in an 11- $\times$ -7 matrix and are used with the DLCG (Down-line Loaded Character Generator).

### INSTALLATION AND INTERFACING

Both parallel and serial interfaces come with the unit, and there is an optional high-speed (19.2K baud) serial interface available.

### QUALITY AND PERFORMANCE

Compared to other printers, the quality of the Okidata printers is outstanding. Even at top speeds, the letters are fully formed, and even the draft quality is good.

The bottom feed provides you with the convenience of using multiple forms, and the tear bar saves a lot of wasted paper. The graphics resolution and the correspondence-quality mode, however, leave a little to be desired.

## VENDOR SUPPORT

There is a 90-day warranty on parts and labor. The print head is covered for 1 year. Technical support is provided through 1-800-OKIDATA.

## MT 160L and MT 180L

160L—\$798.00

Mannesmann-Tally Corp.

180L—\$1098.00

### RATINGS

- A Overall rating
- B Price/performance
- B Software compatibility
- A Ease of installation
- B Documentation
- A Vendor support

### FEATURES

Type:	Impact
Matrix size:	7 × 9
Descenders:	+
Speed:	160 cps
Bidirectional:	+
Logic-seeking:	+
Correspondence:	
Speed:	40 cps
Matrix size:	20 × 18
Dot graphics:	64 × 100 dpi
Print:	
Expanded:	+
Compressed:	+
Emphasized:	+
Centronics	
parallel:	+
Serial:	+
Friction feed:	+
Pin feed:	+
Characters per	
line:	
160L:	80, 96, 132, 160
180L:	132, 158, 218, 264
Paper size:	
160L:	10"
180L:	15"
Paper type:	Standard

## PRODUCT SUMMARY

These models are high-speed printers offering two modes: text mode and

correspondence-quality mode. The MT 180L is the same as the MT 160L except it has a wide carriage. This printer is bidirectional and logic-seeking in the standard test mode only. Friction feed is standard, and an attachment can be clipped on to provide tractor and roll paper feed.

On the front panel is a YES and a NO switch pad, which is used when the printer asks you for specific information to set print functions and parameters (lines per inch, characters per inch, alternate character sets). There is also a test button, as well as a fault button besides the regular buttons for on line, off line, line feed, and form feed.

## **FEATURES FOR WORD PROCESSING**

For word processing applications, the MT 160 features a 7- $\times$ -9 matrix, a full set of 96 ASCII characters, and foreign language characters. The 7- $\times$ -9 matrix creates smaller characters, but they are fully formed with true descenders. Special word processing features include auto text centering, right-margin justification, and proportional spacing.

You can program the printer to use a variety of fonts by selecting the proper parameters. Special print fonts (enhanced, emphasized, and double-strike) are available. Using the printer control codes and escape sequences, you can select print modes (normal, condensed, enlarged, double-strike), print functions (superscript, subscript, underline), print action (carriage return, line feed, vertical tab), and paper formatting (page width, form length, line spacing).

The correspondence-quality mode uses a 20- $\times$ -18 matrix to produce an excellent print. Use this mode in conjunction with proportional spacing to enhance the correspondence-quality effect. You can make your selection on the front panel or through your software.

## **FEATURES FOR GRAPHICS**

High-resolution graphics are available with dot densities of 64  $\times$  50 and 64  $\times$  100. There are 31 scientific symbols for special applications. The manufacturer has conveniently used Epson- and Gemini-compatible graphics, to give you use of a wider range of programs. If a program does not specify Mannesmann-Tally in the printer installation menu, select Epson or Gemini.

## **INSTALLATION AND INTERFACING**

Both models are equipped with RS-232C serial and Centronics parallel interfaces.

## **QUALITY AND PERFORMANCE**

This is a well-built printer. It is the correspondence-quality mode that makes this an outstanding printer. Excellent print quality is provided by the 20- $\times$ -18 matrix and the elevated square print needles. In the text mode, the quality is also good, and the fully formed characters are comparable to higher-priced printers.

We printed high-resolution graphics and found them to be very good. The printer is about 1/3 smaller than other, similar printers. The noise level is low to moderate.

## VENDOR SUPPORT

There is a 90-day warranty on parts and labor. The MT-160 is well-made and sturdy. The manufacturer offers good support for its printers. Technical support is available from service dealers across the country.

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## Quadjet

\$895.00

Quadram Corporation

### RATINGS

B Overall rating  
C Price/performance  
B Software compatibility  
B Ease of installation  
C Documentation  
A Vendor support

### FEATURES

Type:	Ink-jet
Matrix size:	5 × 7
Descenders:	+
Speed:	40 cps
Bidirectional:	+
Logic-seeking:	+
Correspondence:	
Speed:	—
Matrix size:	—
Dot graphics:	80 × 80
Print:	
Expanded:	+
Compressed:	—
Emphasized:	—
Centronics	
parallel:	+
Serial:	—
Friction feed:	+
Pin feed:	—
Characters per	
line:	80
Paper size:	8.5"
Paper type:	Standard, clay type, and plastic overlays

## PRODUCT SUMMARY

This is an ink-jet technology printer (Fig. 5-4). The main advantage of this printer is its ultraquiet operation. Ink-jet printers are still a long way from perfection. The Quadjet is one of the first low-cost ink-jet printers that really work. The operation is a little slow, and the print quality is not all that spectacular.

Quadram recommends that you use special clay-coated paper, although it does work with standard paper and plastic overhead overlays.



Fig. 5-4. The Quadjet by Quadram uses ink-jet technology (courtesy of Quadram Corporation).

### **FEATURES FOR WORD PROCESSING**

The printer does not have a word processing mode.

### **FEATURES FOR GRAPHICS**

A program for the Apple is provided to give IDS protocol emulation. Accessory kits are available to adapt Quadjet to the Apple.

### **INSTALLATION AND INTERFACING**

A standard Centronics parallel interface is included.

### **QUALITY AND PERFORMANCE**

As was mentioned, this printer is very quiet. It is very good for the office environment. The print head is, however, only good for about 3.5 million characters.

### **VENDOR SUPPORT**

There is a 90-day limited warranty and a nationwide service network.

## Qantex 7065

\$1995.00

North Atlantic Industries

### RATINGS

A Overall rating  
A Price/performance  
A Software compatibility  
B Ease of installation  
B Documentation  
B Vendor support

### FEATURES

Type:	Dot-matrix
Matrix size:	5 × 6
Descenders:	+
Speed:	300 cps
Bidirectional:	+
Logic-seeking:	+
Correspondence:	
Speed:	65 cps
Matrix size:	18 × 24
Dot graphics:	144 × 144 dpi
Print:	
Expanded:	+
Compressed:	+
Emphasized:	+
Centronics	
parallel:	+
Serial:	+
Friction feed:	+
Pin feed:	-
Characters per	
line:	155, 186, 248
Paper size:	to 15.5" wide
Paper type:	Standard

### PRODUCT SUMMARY

This is one of the finest dot-matrix printers we have seen. The print in letter-quality mode, at 65 cps, is excellent. This print could be used for important documents, or any place letter quality is required.

The draft mode is very useful for quick printouts of long documents. At a very fast 300 cps (3600 words per minute), this heavy-duty printer can print out even your longest report in record time.

### FEATURES FOR WORD PROCESSING

This printer is capable of just about every major word processing function. Features include underlining, boldfacing, subscripting, and superscripting. It can store 40 letter-quality fonts, all at the same time.

## FEATURES FOR GRAPHICS

As dot-matrix printers go, the high resolution of this printer is an above average 144 × 144 dpi. This dpi is more than adequate for most graphics needs.

## INSTALLATION AND INTERFACING

The Qantex 7065 comes with Centronics parallel and RS-232C serial ports. It conforms to the Epson (Graphtrax) protocol for graphics, and Diablo 630 for letter quality, making this printer a very good one for software compatibility

## QUALITY AND PERFORMANCE

There is no question as to the superior quality of this printer. The distributors and users of this product we talked with have never heard of these printers breaking down. Especially impressive is the 500-million-character print head. When you look at the table of print samples, remember that this printer is a dot matrix; you will be impressed.

## VENDOR SUPPORT

The warranty is 90 days for parts and labor. You can ship the printer to their office in New York or any one of eight authorized depots. Their staff were very polite and efficient on the telephone.

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## RX-80, RX-80FT, and RX-100

RX-80—\$399.00

Epson America, Inc.

RX-80FT—\$599.00

RX-100—\$749.00

## RATINGS

- A Overall rating
- A Price/performance
- B Software compatibility
- A Ease of installation
- A Documentation
- C Vendor support

## FEATURES

Type:	Impact
Matrix size:	9 × 9
Descenders:	+
Speed:	100 cps
Bidirectional:	+
Logic-seeking:	+
Correspondence:	
Speed:	—
Matrix size:	—
Dot graphics:	240 × 144
Print:	
Expanded:	+
Compressed:	+
Emphasized:	+

## FEATURES

Centronics	
parallel:	+
Serial:	+
Friction feed:	+ (FT only)
Pin feed:	+
Characters per	
line:	80, 132
Paper size:	10"
	15" (FT only)
Paper type:	Standard

## PRODUCT SUMMARY

This is a low-cost, 80-column printer, which is bidirectional and logic-seeking. There is also a quiet mode at 50 cps for office environments. Friction feed is optional on the RX-80, and a wide carriage (14 inch wide paper) is available on the RX-100 (Fig. 5-5). The printer also features a tear bar for tearing off paper an inch below the print line to save paper. The FT versions have enhanced graphics capability.

## FEATURES FOR WORD PROCESSING

For word processing applications, the RX-80 features a 9- $\times$ -9 matrix (character matrix 5  $\times$  7), 96 standard and italic ASCII characters, and 11 international characters for use in foreign languages.

Using the printer control codes and escape sequences, you can select the print modes (normal, condensed, emphasize, enlarged, double-strike), the print functions



Fig. 5-5. The RX-100 is Epson's wide-carriage version of the RX-80 (courtesy of Epson America, Inc.).



(underline, subscript, superscript), the print action (carriage return, line feed, vertical tab), and the paper format (line spacing, form length, page width).

### FEATURES FOR GRAPHICS

Epson printers with the FT option are known for their fine graphics. There are 32 graphics symbols for creating block graphics, accessed through control codes. These symbols are compatible with the graphics on the Epson HX-20 computer. You can select from a variety of dot densities: 480 dots per 8 inch, 960 dots per 8 inch, or 1920 dots per 8 inch.

The RX-80 also features a *hex dump mode*, where data sent from the computer is printed in hexadecimal notation.

### INSTALLATION AND INTERFACING

Due to its wide popularity, Epson printers are easily interfaced. Many programs for the Apple can be used with Epson printers.

### QUALITY AND PERFORMANCE

These printers offer excellent print quality and graphics resolution. The characters appear well-formed, and the printer is quieter compared to other, similar printers. The tear bar is a convenient feature, which also saves paper.

### VENDOR SUPPORT

There is a 90-day warranty on parts and labor. Technical support is available from authorized dealers who are trained to handle problems.

---

## Scribe

\$299.00

Apple Computer, Inc.

### RATINGS

B Overall rating  
A Price/performance  
B Software compatibility  
A Ease of installation  
B Documentation  
B Vendor support

### FEATURES

Type:	Thermal
Matrix size:	9 × 14
Descenders:	+
Speed:	80 cps
Bidirectional:	-
Logic-seeking:	+
Correspondence:	
Speed:	50 cps
Matrix size:	12 × 15
Dot graphics:	160 × 144 dpi
Print:	
Expanded:	+

## FEATURES

Compressed:	+
Emphasized:	-
Centronics	
parallel:	-
Serial:	+
Friction feed:	+
Pin feed:	+
Characters per	
line:	136
Paper size:	8"
Paper type:	Standard

## PRODUCT SUMMARY

The Scribe printer (Fig. 5-6) is a special type of thermal printer designed for the Apple II family of computers, particularly the Apple IIc. It uses a new process of printing known as *thermal transfer*. Most thermal printers work by burning the image onto specially treated paper; there is no ribbon. The Scribe, however, uses a special ribbon with wax on it, and it melts the wax onto the paper. While it can technically use any plain paper, it should really be used only with smooth-finished paper. More textured papers will produce undesirable results.

## FEATURES FOR WORD PROCESSING

There are two text printing modes. Draft mode produces text at 80 characters per second in 5, 8.5, 10, or 17 characters per inch "Letter-quality" mode produces text at 50 characters per second in either 5 or 10 characters per inch. The printer will also print true subscripts, superscripts, true underlining, and either a slashed or regular 0.

## FEATURES FOR GRAPHICS

The Scribe is really a printer for graphics. It will print in color with a special color ribbon. The ribbon contains three colors of waxes—magenta, cyan, and yellow—and prints other colors by superimposing one color on top of another. The color ribbon consists of repeating bands of colors, each 8 inches wide, resulting in a ribbon life only 1/3 as long as the black ribbon. The color ribbon is also over 40 percent more expensive than the black ribbon. Ribbon changing is easy. Graphics commands are compatible with the Imagewriter.

## INSTALLATION AND INTERFACING

The Scribe comes with a standard RS-232C serial interface and with appropriate cables for connecting it to an Apple IIc, or an Apple II, II+, or IIe with a Super Serial Card.

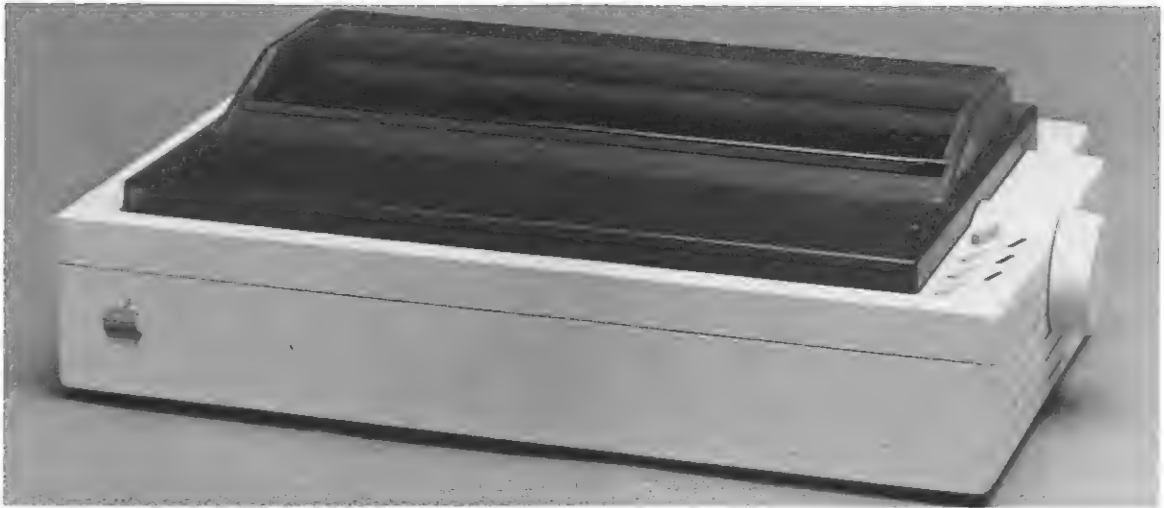


Fig. 5-6. The Scribe is Apple's new thermal printer for the Apple II family of computers (courtesy of Teletex Communications Corp).

### QUALITY AND PERFORMANCE

The thermal transfer technique of the Scribe is responsible for both its assets and its liabilities. The technique results in an image which is more akin to crayon, particularly in color mode, than standard printer ink. The text image is acceptable for many uses, but is not truly letter quality. It is in about the middle range of quality for dot-matrix printers if smooth-finished paper is used. If textured paper is used, the print quality descends to the lower range of quality for dot-matrix printers.

The thermal transfer technique also results in the quiet operation of the Scribe. It is as quiet as most standard thermal printers, and considerably quieter than any impact printer.

The Scribe comes with a built-in paper tray so that you can tuck fanfold paper under it on the desk. This feature results in a footprint of only 12 × 16 inches.

### VENDOR SUPPORT

The Scribe comes with a 90-day warranty. Service is available at Apple's extensive dealer service network.

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## Spirit 80

Parallel—\$399.00

Mannesmann-Tally Corp.

Serial—\$494.00

### RATINGS

- A Overall rating
- B Price/performance
- B Software compatibility

### FEATURES

- |              |        |
|--------------|--------|
| Type:        | Impact |
| Matrix size: | 9 × 8  |
| Descenders:  | +      |

## **RATINGS**

- A Ease of installation
- B Documentation
- A Vendor support

## **FEATURES**

Speed:	80 cps
Bidirectional:	+
Logic-seeking:	+
Correspondence:	
Speed:	-
Matrix size:	-
Dot graphics:	160 × 82
Print:	
Expanded:	+
Compressed:	+
Emphasized:	+
Centronics	
parallel:	+
Serial:	+
Friction feed:	+
Pin feed:	+
Characters per	
line:	80, 132
Paper size:	10"
Paper type:	Standard

## **PRODUCT SUMMARY**

This is a low-cost, bidirectional, and logic-seeking printer, offering a number of features not found in similarly priced printers. The Spirit 80 is compatible with Epson and Gemini printers. This printer is quieter than most, and we tested the optional "Quiet-Pak" (\$80.00) which further reduced the noise level. The tractor feed is preinstalled, as opposed to a tractor feed unit which must be installed with each use. Another feature is a "ready light" which glows when data cannot be accepted from the computer. Unlike most other dot-matrix printers, the Spirit 80 uses a mylar film ribbon.

## **FEATURES FOR WORD PROCESSING**

For word processing applications, the Spirit 80 features a 9- × 8 matrix and 96 standard and italic ASCII characters. The foreign language characters are located in the block-graphics set of characters. Special print fonts (enhanced print, italics, double-strike, etc.) can be accessed.

## **FEATURES FOR GRAPHICS**

Spirit 80 allows you to create bit-mapped graphics, either through the program or by using the 32 block-graphics characters. In the graphics mode, the printer is unidirectional, and print speed is reduced when creating high-resolution graphics. The graphics may be addressed at 80 × 82 in normal density and 160 × 82 in high resolution.

## INSTALLATION AND INTERFACING

The Spirit 80 printer is available in both parallel and serial interface versions.

## QUALITY AND PERFORMANCE

Although the print size appears smaller with the 9- $\times$ -8 matrix, the characters are fully formed, and print quality is excellent, enhanced by the well-developed print head. The mylar ribbon adds to the print quality, but it must be replaced after one use.

## VENDOR SUPPORT

There is a 90-day warranty on parts and labor. Excellent technical support is available from trained service dealers across the country.

---

### STX 80

\$199.00

Star Micronics, Inc.

#### RATINGS

B Overall rating  
B Price/performance  
B Software compatibility  
A Ease of installation  
A Documentation  
B Vendor support

#### FEATURES

Type:	Thermal
Matrix size:	9 $\times$ 9
Descenders:	+
Speed:	60 cps
Bidirectional:	+
Logic-seeking:	+
Correspondence:	
Speed:	-
Matrix size:	-
Dot graphics:	+
Print:	
Expanded:	+
Compressed:	-
Emphasized:	-
Centronics	
parallel:	+
Serial:	-
Friction feed:	+
Pin feed:	-
Characters per	
line:	40, 80
Paper size:	8"
Paper type:	Thermal

## PRODUCT SUMMARY

STX 80, a thermal 80-column printer, has a low cost. It is geared to the hobbyist, since it has very limited serious applications. The thermal paper comes in blue

and black ink, and no ribbon is required. It is quieter than impact printers.

### FEATURES FOR WORD PROCESSING

For word processing applications, the STX 80 uses a 9- $\times$ -9 matrix. There is also a double-width or enlarged mode (selectable through a BASIC program or with control codes), and both modes can be printed on the same line. Printer control codes will also allow you to adjust the line feed, the form feed, the tab set, and the carriage return.

### FEATURES FOR GRAPHICS

This printer features high-resolution graphics through a dot-addressable graphics mode.

### INSTALLATION AND INTERFACING

The STX 80 is equipped with a Centronics parallel interface connection.

### QUALITY AND PERFORMANCE

The print quality in both text and graphics modes is good. The main disadvantage to the STX 80 is the thermal paper. Otherwise it is a good, low-cost printer for lightweight, home use.

### VENDOR SUPPORT

There is a one-year warranty against defects in materials or workmanship. Technical support is available from the manufacturer or the local distributor.

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**TTXpress**

\$229.00

Teletex Communication Corp.

### RATINGS

A Overall rating  
A Price/performance  
B Software compatibility  
A Ease of installation  
C Documentation  
B Vendor support

### FEATURES

Type:	Thermal
Matrix size:	7 $\times$ 9
Descenders:	+
Speed:	50 cps
Bidirectional:	-
Logic-seeking:	-
Correspondence:	
Speed:	-
Matrix size:	-
Dot graphics:	+
Print:	
Expanded:	+
Compressed:	+

## FEATURES

Emphasized:	+
Centronics parallel:	+
Serial:	-
Friction feed:	+
Pin feed:	-
Characters per line:	80/160
Paper size:	8 1/2"
Paper type:	Thermal

## PRODUCT SUMMARY

The TTXpress is a truly unique thermal dot-matrix printer (Fig. 5-7). It weighs only 2 pounds and will print for 2 hours on its batteries. The TTXpress offers a Centronics parallel interface, friction feed of single sheets, and bidirectional paper feeding for graphics. It even has a 2K buffer, which is extraordinary in its price range.

## FEATURES FOR WORD PROCESSING

The TTXpress offers the most commonly used word processing features: descenders, compressed print, enlarged print, emphasized print, and underlining. These features will work with most software and parallel interfaces.

## FEATURES FOR GRAPHICS

The TTXpress has full graphics capability at 72 dots per inch.



Fig. 5-7. The TTXpress is a low-cost, portable printer for use with any Apple computer (courtesy of Teletex Communications Corp.).

## INSTALLATION AND INTERFACING

The TTXpress requires a standard Centronics parallel interface.

## QUALITY AND PERFORMANCE

The TTXpress is made well and provides a surprisingly good-quality printout. If portability is a major factor in your printer selection, this may well be the printer for you.

## VENDOR SUPPORT

There is a 30-day warranty on parts and labor. Technical support is available through an 800 number.

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## WORKSHEET FOR DOT-MATRIX PRINTERS

### PRODUCT

\$ .

### MANUFACTURER

### RATINGS

Overall rating  
Price/performance  
Software compatibility  
Ease of installation  
Documentation  
Vendor support

### FEATURES

Type:  
Matrix size:  
Descenders:  
Speed:  
Bidirectional:  
Logic-seeking:  
Correspondence:  
Speed:  
Matrix size:  
Dot graphics:  
Print:  
Expanded:  
Compressed:  
Emphasized:  
Centronics  
parallel:  
Serial:  
Friction feed:  
Pin feed:  
Characters per  
line:  
Paper size:  
Paper type:



**PRODUCT SUMMARY**

**FEATURES FOR WORD PROCESSING**

**FEATURES FOR GRAPHICS**

**INSTALLATION AND INTERFACING**

**QUALITY AND PERFORMANCE**

**VENDOR SUPPORT**

Table 5-1. Comparative Ratings for Dot-Matrix Printers.

PRINTER	PRICE	RATINGS					
		1	2	3	4	5	6
Alphacom 81	\$ 169.95	B	A	B	A	C	B
D-100	395.00	B	B	B	B	B	B
D-200	595.00	B	B	B	B	C	B
D-300	795.00	B	B	B	B	C	B
Delta 10	549.00	B	A	B	B	A	B
Delta 15	795.00	B	A	B	B	A	B
FX-80	699.00	A	B	A	A	A	C
FX-100	895.00	A	B	A	A	A	C
Gemini 10X	399.00	B	A	B	B	A	B
Gemini 15X	549.00	B	A	B	B	A	B
Imagewriter (10" carriage)	595.00	A	B	A	A	A	B
Imagewriter (15" carriage)	749.00	A	B	A	A	A	B
LQ-1500	1395.00	A	B	A	A	A	A
Microline 82A	349.00	A	B	C	A	B	A
Microline 83A	749.00	A	B	C	A	B	A
Microline 84 Step 2 (parallel)	1099.00	B	B	C	A	B	A
(serial)	1219.00	B	B	C	A	B	A
Microline 92 (parallel)	589.00	B	B	C	A	B	A
(serial)	698.00	B	B	C	A	B	A
Microline 93 (parallel)	899.00	B	B	C	A	B	A
(serial)	998.00	B	B	C	A	B	A
MT 160L	798.00	A	B	B	A	B	A
MT 180L	1098.00	A	B	B	A	B	A
Quadjet	895.00	B	C	B	B	C	A
Qantex 7095	1995.00	A	A	A	B	B	B
RX-80	399.00	A	A	B	A	A	C
RX-80FT	599.00	A	A	B	A	A	C
RX-100	749.00	A	A	B	A	A	C
Scribe	299.00	B	A	B	A	B	B
Spirit 80 (parallel)	399.00	A	B	B	A	B	A
Spirit 80 (serial)	494.00	A	B	B	A	B	A
STX 80	199.00	B	B	B	A	A	B
TTXpress	229.00	A	A	B	A	C	B
<b>KEY TO RATINGS</b>							
1—Overall rating				4—Ease of installation			
2—Price/performance				5—Documentation			
3—Software compatibility				6—Vendor support			

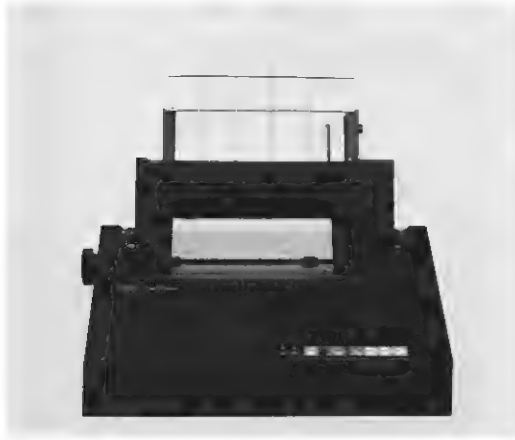
Table 5-2. Comparative Features for Dot-Matrix Printers.

Product	FEATURES																		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Alphacom 81	T	8 x 8	-	80	+	-	-	-	80 x \$3080	+	-	+	+	-	+	-	80	8	T
D-100	I	9 x 9	+	120	+	+	-	-	120 x 72	+	+	+	+	+	+	+	80	11	S
D-200	I	9 x 9	+	120	+	+	60	17 x 18	120 x 72	+	+	+	+	+	+	+	80	11	S
D-300	I	9 x 9	+	140	+	+	70	17 x 18	120 x 72	+	+	+	+	+	+	+	132	15	S
Delta 10	I	9 x 9	+	160	+	+	-	-	240 x 144	+	+	+	+	+	+	+	80	10	S
Delta 15	I	9 x 9	+	160	+	+	-	-	240 x 144	+	+	+	+	+	+	+	80	10	S
FX-80	I	11 x 9	+	160	+	+	-	-	240 x 144	+	+	+	+	+	+	+	80	8	S
FX-100	I	9 x 11	+	160	+	+	-	-	240 x 144	+	+	+	+	+	+	+	136	15	S
Gemini 10X	I	9 x 9	+	120	+	+	-	-	240 x 144	+	+	+	+	+	+	+	80	8	S
Gemini 15X	I	9 x 9	+	120	+	+	-	-	240 x 144	+	+	+	+	+	+	+	80	8	S
Imagewriter	I	7 x 9	+	120	+	+	-	12 x 18	240 x 144	+	+	+	+	+	+	+	136	10	S
LQ-1500	I	9 x 17	+	200	+	+	67	37 x 17	160	+	+	+	+	+	+	+	136	16	S
Micro 82A	I	9 x 9	+	120	+	+	-	-	60 x 66	+	+	+	+	+	+	+	80	8	S
Micro 83A	I	9 x 9	+	120	+	+	-	-	60 x 66	+	+	+	+	+	+	+	136	8	S
Micr 84 (P)	I	9 x 9	+	200	+	+	50	13 x 17	103 x 72	+	+	+	+	+	+	+	136	15	S
Micr 84 (S)	I	9 x 9	+	200	+	+	50	13 x 17	103 x 72	+	+	+	+	+	+	+	136	15	S
Micr 92 (P)	I	9 x 9	+	160	+	+	40	9 x 17	72 x 72	+	+	+	+	+	+	+	80	10	S
Micr 92 (S)	I	9 x 9	+	160	+	+	40	9 x 17	72 x 72	+	+	+	+	+	+	+	80	11	S
Micr 93 (P)	I	9 x 9	+	160	+	+	40	9 x 17	72 x 72	+	+	+	+	+	+	+	136	15	S
Micr 93 (S)	I	9 x 9	+	160	+	+	40	9 x 17	72 x 72	+	+	+	+	+	+	+	136	15	S
MT 160L	I	7 x 9	+	160	+	+	40	20 x 18	64 x 100	+	+	+	+	+	+	+	80	10	S
MT 180L	I	7 x 9	+	160	+	+	40	20 x 18	64 x 100	+	+	+	+	+	+	+	132	15	S
Quadjet	J	5 x 7	+	40	+	+	-	-	80 x 80	+	+	+	+	+	+	+	80	8	S
Qantex	I	5 x 6	+	300	+	+	65	18 x 24	144 x 144	+	+	+	+	+	+	+	155	15	S
RX-80	I	9 x 9	+	100	+	+	-	-	240 x 144	+	+	+	+	+	+	+	80	10	S
RX-80 FT	I	9 x 9	+	120	+	+	-	-	240 x 144	+	+	+	+	+	+	+	80	11	S
RX-100	I	9 x 9	+	120	+	+	-	-	240 x 144	+	+	+	+	+	+	+	80	11	S
Scribe	T	9 x 14	+	80	-	+	50	12 x 15	160 x 144	+	+	+	+	+	+	+	136	8	S
Sprt 80 (P)	I	9 x 8	+	80	+	+	-	-	160 x 82	+	+	+	+	+	+	+	80	10	S
Sprt (S)	I	9 x 8	+	80	+	+	-	-	160 x 82	+	+	+	+	+	+	+	80	10	S
STX-80	T	9 x 9	+	60	+	+	-	-	+	+	+	+	+	+	+	+	80	8	T
TTX press	T	7 x 9	+	50	-	-	-	-	72	+	+	+	+	+	+	+	80	8	T

## KEY TO FEATURES

- 1—Type (T = Thermal, I = Impact, J = Ink Jet)  
 2—Matrix size (width x height)  
 3—Descenders  
 4—Speed (characters per second)  
 5—Bidirectional  
 6—Logic-seeking  
 7—Correspondence speed (characters per second)  
 8—Correspondence matrix size (width x height)  
 9—Dot graphics (dots per inch / + equals variable)  
 10—Expanded print  
 11—Compressed print  
 12—Emphasized print  
 13—Centronics parallel  
 14—Serial  
 15—Friction feed  
 16—Pin feed  
 17—Characters per line  
 18—Paper size (inches)  
 19—Paper type (S = Standard, T = Special thermal)

# Chapter 6



## Fully-Formed-Character Printers

Fully-formed-character printers are used for correspondence and in situations where good looks are more important than speed. The print speed is generally much slower than a dot-matrix printer because of the more complex mechanical motions typically used to create fully formed characters. The characters are fixed, unlike the ones generated by dot-matrix printers. The fully-formed-character printer works in much the same fashion as the electric typewriter. The laser printer, of course, produces characters in a totally different way.

### DAISY-WHEEL PRINTERS

Our reviews on fully-formed-character printers will cover the daisy-wheel printer. The characters are fixed on a wheel resembling a daisy. The wheel moves horizontally across the page, rotates until the desired character is lined up, and strikes it against an inked ribbon. The wheels are removable and allow you to change the style of the print easily. Some printers offer more of a variety in print styles than others, and our reviews will note this fact.

Print speeds range from 12 to 50 characters per second (cps) depending on price and features. Another feature most daisy-wheel printers have is a buffer to hold data from the computer for input to the printer when needed. A sheet feeder option allows you to automatically feed single sheets of paper to the printer, rather than one at a time. In some cases, a keyboard can be attached so the printer can be used as a regular typewriter.

For work processing, there are even more features available. They include special

print effects (boldface, shadow print, full line and word underline, superscript, subscript), print functions (line space, carriage return, form feed, backspace), a variety of character pitches (10, 12, or 15 cpi), automatic proportional spacing, double-strike, and forward and backward print modes. Some of these features are accessible from the front panel, the printer control codes and escape sequences, or the DIP switches.

The graphics mode is limited on these printers, but it does allow you to create graphs and charts through your program or the plot mode on some models.

Some models use friction feed paper similar to a typewriter. Others use a continuous roll of paper, which may tend to creep over to one edge after a few pages. A good-quality printer will offer both options. A tractor feed is optional in some cases. Fully-formed-character printers are often supplied with a serial interface as standard.

## OTHER TYPES OF FULLY-FORMED-CHARACTER PRINTERS

The daisy-wheel printer was one of the earlier and most successful types of fully-formed-character printers. Some years ago the daisy-wheel printer was essentially a synonym for fully-formed-character printers; however, there are a number of other types of printers available today which produce fully formed characters. One of the simplest alternatives to the daisy wheel is the standard electric typewriter. A number of companies have produced typewriters which function exactly like those electronic typewriters which have one arm for every letter with the element at the end. These then interface to the computer and act as fully-formed-character printers. In some cases these printers have a keyboard and can also be used as an electronic typewriter.

Another type of fully-formed-character printer uses a device shaped somewhat like a small spool or thimble. They are known as *thimble printers*, and except for the shape of the device that bears the type, they function exactly like a daisy-wheel printer.

The ball printer functions in the same way as the IBM Selectric typewriter, which instead of using a daisy-wheel or a thimble, uses a ball to contain the type for the characters. The ball rotates and twists to bring the appropriate letter into contact with the ribbon and the paper.

Fully formed characters can also be produced by an *ink-jet printer*. While most ink-jet printers produce dot-matrix characters, there are some of the market which produce fully formed characters.

Finally, fully-formed characters can be produced by a *laser*. The Hewlett-Packard Laser jet is the outstanding example in this field. In this case since the fully formed characters are produced by an electrical and optical system rather than by precast mechanical representations of the letters, the same printer is also capable of producing a variety of fonts. This feature allows the use of several sizes of type or italics without the awkwardness of changing a type wheel.

# Apple Daisy Wheel Printer

\$2195.00

Apple Computer, Inc.

## RATINGS

- A Overall rating
- C Price/performance
- B Software compatibility
- A Ease of installation
- A Documentation
- B Vendor support

## FEATURES

Speed:	40 cps
Bidirectional:	+
Logic-seeking:	+
Centronics parallel:	-
Serial:	+
Friction feed:	+
Pin feed:	+
Characters per line:	198
Paper size:	to 15" wide

## PRODUCT SUMMARY

The Apple Daisy-Wheel Printer is a high-quality, high-speed daisy-wheel printer. It uses special Apple daisy wheels which contain 130 characters. A tractor feed is available at an extra cost. A variety of the special 130-character print wheels are available, including Courier 10, Prestige 12, Gothic 15, and Executive.

## FEATURES FOR WORD PROCESSING

The printer functions in 10-pitch, 12-pitch, 15-pitch, and proportional-spacing modes. It has programmable hammer intensity and ribbon movement. It permits underlining as well as superscripting and subscripting. It also permits variable horizontal and vertical formatting and variable form length.

## FEATURES FOR GRAPHICS

There is a special, programmable graphics mode available with the printer.

## INSTALLATION AND INTERFACING

The Apple Daisy-Wheel Printer comes with a serial interface. It requires a Super Serial Card or similar interface on the Apple II, II+, or IIe. It will plug directly into the printer port on the Apple IIc.

## QUALITY AND PERFORMANCE

The Apple Daisy-Wheel Printer is an expensive printer. It is, however, a heavy-duty, high-quality, and extremely reliable machine.

## **VENDOR SUPPORT**

The printer comes with Apple's standard 90-day warranty. Service is available through Apple's dealer service network.

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### **CR-II**

Parallel—\$599.00

Comrex International, Inc.

Serial —\$649.00

### **RATINGS**

A Overall rating  
A Price/performance  
B Software compatibility  
A Ease of installation  
B Documentation  
B Vendor support

### **FEATURES**

Speed:	12 cps
Bidirectional:	+
Logic-seeking:	+
Centronics parallel:	+
Serial:	+
Friction feed:	+
Pin feed:	—
Characters per line:	110
Paper size:	to 13.5" wide

## **PRODUCT SUMMARY**

This printer is low-cost and bidirectional in the text mode. There is a standard 5K buffer so you can make multiple copies (it reprints the buffer) using the COPY switch. A large variety of print wheels is available, and this printer is compatible with Diablo 1640/1650 software. Tractor feed and sheet feed are options. With the optional keyboard, this printer can be used as a typewriter. You can also use multicolor ribbons and correction tape.

## **FEATURES FOR WORD PROCESSING**

For word processing applications, there are many features, such as automatic proportional spacing; shadow print and double-strike modes; auto underline; superscripts and subscripts, and programmable pitch, which also comes with a switch control. You can set the proportional spacing and print pitch from the front control panel.

## **FEATURES FOR GRAPHICS**

You can overcome the limited graphics by using the escape sequences for the plot mode, which allows you to move the print head. By controlling this movement, and by printing the desired text or graphic characters, you can create very good charts and graphs.

## INSTALLATION AND INTERFACING

You can get this printer with a parallel or serial port, depending on your needs.

## QUALITY AND PERFORMANCE

The CR-II is a very good printer and uses the Brother print wheel. The buffer is small but very nice since it is not standard on many printers. With the sheet feeder option, you can automatically feed single sheets into the printer, rather than one at a time. The graphics may be limited, but would enhance any report with graphs and charts.

## VENDOR SUPPORT

There is a limited 90-day warranty against defects in material and workmanship. Technical support is available from local dealers.

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### CR-III

Parallel—\$995.00

Comrex International Inc.

Serial — 1045.00

## RATINGS

- A Overall rating
- A Price/performance
- B Software compatibility
- B Ease of installation
- B Documentation
- B Vendor support

## FEATURES

Speed:	23 cps
Bidirectional:	+
Logic-seeking:	+
Centronics parallel:	+
Serial:	+
Friction feed:	+
Pin feed:	-
Characters per line:	132
Paper size:	to 14 7/8" wide

## PRODUCT SUMMARY

This is the wide-carriage model from Comrex. It is bidirectional and logic-seeking in the text mode, and is equipped with a 5K buffer to hold three to four pages. Multiple copies can be made by using the COPY switch to reprint the buffer contents. A large variety of print wheels is available. There is an optional cut sheet feeder, a tractor feed mechanism, and an automatic paper loading feature to load single sheets at a specific position.



## FEATURES FOR WORD PROCESSING

The CR-III has a wide range of features for word processing applications, including automatic proportional spacing, shadow print and double-strike modes, auto-underline, programmable pitch (available also with switch control), subscript and superscript. The front panel is used to set the proportional spacing and print pitch. Printer control codes select the print formatting features, such as margins settings, vertical and horizontal spacing, and paper length. You can use the DIP switches to select some features and specific foreign language character sets. The CR-III comes with two-color ribbons for color printing.

## FEATURES FOR GRAPHICS

This printer has limited graphics capabilities; however, using the proper escape sequences you can use the plot mode to move the print head. This movement of the print head with the printing of the desired text or graphics character can create very good graphics for charts and graphs.

## INSTALLATION AND INTERFACING

The CR-III is compatible with Diablo 630 software. The printer is available with a serial or parallel interface.

## QUALITY AND PERFORMANCE

The CR-III is an excellent printer using the Brother print wheel. Although it is too small for extensive word processing, the buffer is a unique and useful feature. The sheet feeder option lets you automatically feed single sheets into the printer, rather than one by one. The graphics are limited but can be used to enhance your documents with charts and graphs.

## VENDOR SUPPORT

There is a limited 90-day warranty against defects in materials and workmanship. Technical support is through local dealers.

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## Diablo 630 ECS

\$2529.00

Diablo Systems Incorporated

### RATINGS

A Overall rating  
A Price/performance  
A Software compatibility  
B Ease of installation  
A Documentation  
A Vendor support

### FEATURES

Speed:	40 cps
Bidirectional:	+
Logic-seeking:	+
Centronics parallel:	+
Serial:	-
Friction feed:	+

## FEATURES

Pin feed:	-
Characters per line:	132, 158, 198
Paper size:	to 13.2" wide

## PRODUCT SUMMARY

The Diablo 630 ECS is one of the only letter-quality printers that can print virtually all characters the Apple can display. The 630 ECS features a unique print wheel with 192 characters, as well as the ability to construct 49 additional characters.

## FEATURES FOR WORD PROCESSING

The Diablo 630 ECS has many text formatting features. They include true proportional spacing, bold and shadow printing, superscripting and subscripting, and of course, the extended character set.

## FEATURES FOR GRAPHICS

Graphics, shading, and block graphics modes are available.

## INSTALLATION AND INTERFACING

The software compatibility and hardware interfacing are two of the strong points of the Diablo.

## QUALITY AND PERFORMANCE

The Diablo 630 ECS has become an industry standard. It is interesting to note that most other printer companies are bragging about their Diablo 630 emulation, which should tell you the importance of Diablo in the letter-quality market.

The company lives up to its claims. The 630 is an extremely durable, rugged printer. It is designed to take a lot of punishment.

## VENDOR SUPPORT

Diablo offers a 1-year warranty on its printers.

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## DX-15

Serial or parallel—\$499.00

Dynax, Inc.

## RATINGS

- A Overall rating
- A Price/performance
- B Software compatibility

## FEATURES

Speed:	13 cps
Bidirectional:	+

## **RATINGS**

A Ease of installation  
B Documentation  
B Vendor support

## **FEATURES**

Logic-seeking:	+
Centronics parallel:	
Serial:	+
Friction feed:	+
Pin feed:	+
Characters per line:	-
Paper size:	110 to 13.5" wide

## **PRODUCT SUMMARY**

This popular, low-cost model is loaded with special features. It is bidirectional and comes with a standard 3K buffer, or an optional 5K buffer, for holding text pages. This buffer enables you to print multiple copies using the COPY switch. Another option is a keyboard which can be used as a typewriter. Its cost is \$195. A large variety of print wheels is available. The DX-15 is compatible with Diablo 630 software. A sheet feeder is available for \$250, and a tractor feed for \$120.

## **FEATURES FOR WORD PROCESSING**

This printer has a wide range of features which can be used in word processing applications, including automatic proportional spacing, shadow print and double-strike modes, auto underline, superscripts and subscripts, and programmable pitch. The front panel can be used to set the proportional spacing and the print pitch.

## **FEATURES FOR GRAPHICS**

The DX-15 has limited graphics capabilities. With the appropriate options you can initiate the plot mode through proper escape sequences to allow the print head to move around. You can create very good graphs and charts by controlling the movement and position of the print head to print the desired text or graphics characters.

## **INSTALLATION AND INTERFACING**

Most interfaces will work adequately in their individual word processing modes. When given options on a printer setup menu, select the Diablo option first. Otherwise, use general parallel printers.

## **QUALITY AND PERFORMANCE**

This is an excellent low-cost printer. It uses the Brother print wheel; so there is a wide selection of types available. The buffer is a unique feature, although it is too small for any sophisticated applications. The sheet feeder option saves time and energy spent on feeding sheets one at a time. The graphics, though limited, would enhance any document with graphs and charts.

## VENDOR SUPPORT

There is a 90-day warranty on parts and labor. Technical support is available from local dealers.

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## EXP-500

Serial or parallel—\$549.00

Silver-Reed America, Inc.

### RATINGS

B Overall rating  
B Price/performance  
B Software compatibility  
A Ease of installation  
B Documentation  
B Vendor support

### FEATURES

Speed:	16 cps
Bidirectional:	+
Logic-seeking:	+
Centronics	
parallel:	+
Serial:	+
Friction feed:	+
Pin feed:	—
Characters per	
line:	132
Paper size:	to 13.2" wide

## PRODUCT SUMMARY

The EXP-500 is a bidirectional (in the line print mode), logic-seeking printer. It offers a serial mode for printing data as received from the computer, and a line print mode, where the received data is input into a buffer and printed one line at a time after a line feed, form feed, or carriage return. The modes are selected with the proper DIP switches. Friction feed is standard; however, a tractor feed unit can be purchased for \$159.

## FEATURES FOR WORD PROCESSING

For word processing applications many useful features are available, including character pitch (10, 12 or 15 cpi). Using the printer control codes, you can select boldface, underline, subscript, and superscript for special effects. Using escape sequences, you can access print-motion control functions like line spacing, form feed, carriage return, and backspace. As long as you can send escape sequences through the program to access the special print functions, most word processing programs will work with this printer.

## FEATURES FOR GRAPHICS

The EXP-500 has limited graphics; however, you can use the proper escape sequences to move the print head around. When you control the movement and position of the print head in this manner to print the desired text or graphics characters,

you can create very good graphs and charts. The manual describes how the vertical and horizontal motion indexes can create graphic effects through your software.

### **INSTALLATION AND INTERFACING**

This printer comes with a parallel or serial interface. Choose the one which corresponds to your existing printer protocols or is recommended by your software.

### **QUALITY AND PERFORMANCE**

This is a good printer with a wide selection of print wheels for any application. The serial and lineprinter modes are useful and unique. Graphics are limited, but they can be used to create graphs and charts.

### **VENDOR SUPPORT**

There is a 90-day warranty on parts and labor. Technical support is available through local dealers or an 800 number.

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## **F-10 Printmaster**

Parallel or serial—\$1995.00

C. Itoh Digital Products, Inc.

### **RATINGS**

B Overall rating  
A Price/performance  
B Software compatibility  
B Ease of installation  
B Documentation  
A Vendor support

### **FEATURES**

Speed:	55 cps
Bidirectional:	+
Logic-seeking:	+
Centronics	
parallel:	+
Serial:	+
Friction feed:	+
Pin feed:	-
Characters per	
line:	136
Paper size:	to 15" wide

### **PRODUCT SUMMARY**

This is a heavy-duty fully-formed-character printer which features a very fast print speed and carriage return time. It is bidirectional and comes with a 256-character buffer. A 2K buffer is optional. It is fairly quiet, making it appropriate for office use. Also the speed of 55 cps makes it an excellent choice for a heavy-usage environment.

### **FEATURES FOR WORD PROCESSING**

The F10 Printmaster performs all of the basic word processing functions. The

paper handling functions include: friction feed, optional tractor (\$325.00), optional cut sheet feeder (\$455.00), three-part form, and multistrike ribbon.

### **FEATURES FOR GRAPHICS**

There are no graphics features.

### **INSTALLATION AND INTERFACING**

There are two different versions of the Printmaster—a parallel and a serial. Choose the printer to suite your needs. An IEEE-488 interface is available as an option.

### **QUALITY AND PERFORMANCE**

For the price, this is a very sturdy printer. It uses standard industry ribbon cartridges.

A rate of 55 cps is pretty quick for a daisy-wheel printer. If you need speed and want quality, you should look into this printer.

### **VENDOR SUPPORT**

There is a 1-year warranty and a national service network. C. Itoh printers are distributed by Leading Edge Products, Inc. and are supported by its authorized service centers.

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## **F-10 StarWriter**

Parallel or serial—\$1795.00

C. Itoh Digital Products, Inc.

### **RATINGS**

B Overall rating  
A Price/performance  
B Software compatibility  
B Ease of installation  
B Documentation  
A Vendor support

### **FEATURES**

Speed:	40 cps
Bidirectional:	+
Logic-seeking:	+
Centronics	
parallel:	+
Serial:	+
Friction feed:	+
Pin feed:	—
Characters per	
line:	136
Paper size:	to 15" wide

### **PRODUCT SUMMARY**

This is a heavy-duty, fully-formed-character printer. It is bidirectional and comes

with a 256-character buffer. A 2K buffer is optional. It is fairly quiet, although a sound cover of some type would make it more appropriate for the office. At 40 cps the F-10 StarWriter is quite fast for a letter-quality printer, but not as fast as the F-10 Printermaster, which has the same features and costs only \$200.00 more.

### FEATURES FOR WORD PROCESSING

The F10 StarWriter performs all of the basic word processing functions. The paper handling functions include friction feed, optional tracter (\$325.00), optional cut sheet feeder (\$455.00), three-part form, and multistrike ribbon.

### FEATURES FOR GRAPHICS

There are no graphics features.

### INSTALLATION AND INTERFACING

There are two types of interface versions to choose from—a parallel and a serial. Choose the printer that suit your needs. An IEEE-488 interface is also available as an option.

### QUALITY AND PERFORMANCE

This is a very sturdy printer, and the speed will be more than adequate for most types of use. If you want a good-quality printer, you should look into this one.

### VENDOR SUPPORT

There is a 1-year warranty and a national service network. C. Itoh printers are distributed by Leading Edge Products, Inc. and are supported by its national service centers.

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**HR-25****\$845.00**

Brother

#### RATINGS

A Overall rating  
A Price/performance  
B Software compatibility  
B Ease of installation  
B Documentation  
A Vendor support

#### FEATURES

Speed:	23 cps
Bidirectional:	+
Logic-seeking:	+
Centronics	
parallel:	+
Serial:	+
Friction feed:	+
Pin feed:	-
Characters per	
line:	165
Paper size:	to 16.5" wide

## PRODUCT SUMMARY

The Brother HR-25 is a wide-carriage printer from Brother and is bidirectional and logic-seeking. An optional sheet feeder (\$269.00) lets you feed single sheets automatically, rather than one at a time. An optional tractor feed (\$149.00) is also available. There is a 3K buffer included, which is capable of holding about three to four pages of material. Using this buffer you can make multiple copies with the COPY switch. There are a large number of print wheel types available. The printer is compatible with the Diablo 630 software.

## FEATURES FOR WORD PROCESSING

For word processing applications, there is an impressive array of features, including automatic proportional spacing, shadow print, double-strike, programmable pitch (10, 12 or 15 cpi), auto underline, superscript, and subscript. There is a front panel for setting the proportional spacing and the print pitch.

Using printer control codes you may select print formatting (margin set), horizontal and vertical spacing, and paper length. Using DIP switches, other features are available, including specific foreign language character sets.

When a printer setup menu calls for the Diablo option in a word processing program, use that option first before the general parallel printers.

## FEATURES FOR GRAPHICS

This printer provides limited graphics. Using the proper escape sequences, you can access the plot mode. By manipulating the print head and printing the desired graphics or text characters, you can achieve some success with graphs and charts.

## INSTALLATION AND INTERFACING

Both serial and parallel interface versions are available.

## QUALITY AND PERFORMANCE

This is an excellent printer with a wide range of applications. The buffer is too small, and graphics are too limited for sophisticated applications, however.

## VENDOR SUPPORT

There is a 90-day warranty on parts and labor. Technical support is available through local dealers. Brother printers are distributed through Dynax, Inc.

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### Juki Model 6100

Parallel—\$599.00

Juki Industries of America, Inc.

Serial—\$758.00

### RATINGS

B Overall rating

### FEATURES

Speed:

18 cps



## **RATINGS**

C Price/performance  
B Software compatibility  
B Ease of installation  
B Documentation  
B Vendor support

## **FEATURES**

Bidirectional:	+
Logic-seeking:	+
Centronics	
parallel:	+
Serial:	+
Friction feed:	+
Pin feed:	+
Characters per	
line:	100, 110, 132, 165
Paper size:	to 11" wide

## **PRODUCT SUMMARY**

This is an inexpensive, light-duty printer. The 18-cps operation is very acceptable for printers in this price range.

Another added feature is the 2K buffer. It does not add too much to the cost, yet it is big enough to be useful. Most of the people who use low-cost letter-quality printers, do not print long documents. Therefore, the huge data buffers never get used to their true potential; they only add to the cost.

## **FEATURES FOR WORD PROCESSING**

The Juki performs all of the basic text formatting functions. This printer also uses the readily available IBM Selectric ribbons.

## **FEATURES FOR GRAPHICS**

There are no graphics features.

## **INSTALLATION AND INTERFACING**

This printer comes with Centronics and RS-232C interfaces.

## **QUALITY AND PERFORMANCE**

In this price range, the Juki 6100 is the most popular letter-quality printer. One disturbing note is the short mean time between failure—2500 at 25 percent duty cycle—which indicates that this printer is not capable of long-term heavy-duty use.

## **VENDOR SUPPORT**

This machine is supported by a 1-year warranty.

## NEC 2050 Spinwriter

\$925.00

NEC Information Systems, Inc.

### RATINGS

A Overall rating  
A Price/performance  
B Software compatibility  
B Ease of installation  
A Documentation  
A Vendor support

### FEATURES

Speed:	20 cps
Bidirectional:	+
Logic-seeking:	+
Centronics parallel:	+
Serial:	-
Friction feed:	+
Pin feed:	+
Characters per line:	136, 163, 203
Paper size:	to 13.6" wide

### PRODUCT SUMMARY

The NEC 2050 is an inexpensive, lightweight, printer. Some of the options include a unidirectional tractor, cut sheet guide, cut sheet feeder, and an envelope handler.

Like the other Spinwriters, the NEC 2050 uses the exclusive NEC Thumbwheel printing elements with up to 128 characters each. This is more than any other letter-quality printer.

### FEATURES FOR WORD PROCESSING

With the 2050, you can do underlining, proportional spacing, double-strike, shadow print, right justification, left justification and full justification. The 2050 can handle from one- to four-part forms, single strike, or multistrike ribbons.

### FEATURES FOR GRAPHICS

The 2050 supports high-resolution graphic positioning.

### INSTALLATION AND INTERFACING

A parallel interface comes with this printer.

### QUALITY AND PERFORMANCE

If you want a light-duty printer for your Apple, then this is the printer for you. In this price range, it is one of the most popular printers available.

## **VENDOR SUPPORT**

There is a 1-year warranty on parts and labor.

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## **NEC 3550 Spinwriter**

\$1750.00

NEC Information Systems

### **RATINGS**

A Overall rating  
A Price/performance  
A Software compatibility  
B Ease of installation  
B Documentation  
A Vendor support

### **FEATURES**

Speed:	33 cps
Bidirectional:	+
Logic-seeking:	+
Centronics	
parallel:	+
Serial:	-
Friction feed:	+
Pin feed:	-
Characters per	
line:	136, 163, 204
Paper size:	to 16" wide

## **PRODUCT SUMMARY**

The NEC 3550 is by far the most popular letter-quality printer. It is one of NEC's most innovative printers. Containing 60 percent less parts than other printers, only one circuit board, and a smaller power supply, the 3550 is designed for heavy-duty use and a long life.

## **FEATURES FOR WORD PROCESSING**

The 3550 would not be much of an office printer if it did not have many word processing features. Such things as double-strike, shadowing, underlining, proportional and microspacing, are all included. Optional word processing accessories include a cut sheet feeder, a cut sheet guide, and a bidirectional form tractor.

## **FEATURES FOR GRAPHICS**

A high-resolution graphics positioning mode is available to stimulate graphics. Because the resolution is variable, you can get incredibly good definition.

## **INSTALLATION AND INTERFACING**

The NEC 3550 comes with a parallel interface. As far as software compatibility goes, everything works on the 3550.

## **QUALITY AND PERFORMANCE**

This is one of the best-performing printers on the market. It is definitely designed for the office market.

NEC chose to design its own type of daisy wheel to use with the Spinwriter series, called a Thumbwheel. It looks rather like a daisy wheel with the tines bent up to form a cup. The entire wheel looks like a thimble, and the design allows the daisy wheel to contain 128 characters, as opposed to the 96 found on standard wheels.

## **VENDOR SUPPORT**

NEC offers a 90-day limited warranty. Most repairs are done at local authorized service centers.

---

## **Olympia ESW 3000**

\$1899.00

Olympia USA Inc.

### **RATINGS**

B Overall rating  
B Price/performance  
B Software compatibility  
B Ease of installation  
B Documentation  
B Vendor support

### **FEATURES**

Speed:	50 cps
Bidirectional:	+
Logic-seeking:	+
Centronics	
parallel:	+
Serial:	+
Friction feed:	+
Pin feed:	+
Characters per	
line:	150, 180, 225
Paper size:	to 17" wide

## **PRODUCT SUMMARY**

The Olympia ESW 3000 is a medium-duty printer, using daisy-wheel technology to produce fully formed characters. Using a variety of print wheels, this printer is very versatile. Because of the print speed of this printer, it is suitable for an office, or light-duty data processing environment.

## **FEATURES FOR WORD PROCESSING**

The ESW 3000 printer has all of the required features to perform as a truly useful peripheral. An especially nice feature is the ability to generate seven copies simultaneously.

## **FEATURES FOR GRAPHICS**

This printer has bidirectional horizontal and vertical tabulation.

## **INSTALLATION AND INTERFACING**

This printer comes with a parallel, serial, and IEEE-488 printer interface. Soft-

ware compatibility features Diablo 630 emulation.

### **QUALITY AND PERFORMANCE**

The ESW 3000 is a real joy to use. It is quiet, rugged, and versatile. The 4K buffer tops it off. What more needs to be said?

### **VENDOR SUPPORT**

There are repair centers in every major city, all across the country.

---

## **Olympia Electronic Compact RO**

\$649.00

Olympia USA Inc.

### **RATINGS**

B Overall rating  
A Price/performance  
B Software compatibility  
C Ease of installation  
B Documentation  
B Vendor support

### **FEATURES**

Speed:	14 cps
Bidirectional:	+
Logic-seeking:	+
Centronics	
parallel:	+
Serial:	+
Friction feed:	+
Pin feed:	+
Characters per	
line:	115, 138, 172
Paper size:	to 14.4" wide

### **PRODUCT SUMMARY**

The Electronic Compact RO is a low-cost home printer (Fig. 6-1). It uses daisy-wheel technology to produce fully formed characters. This is a very cost-effective printer; not heavy duty, but not expensive.

### **FEATURES FOR WORD PROCESSING**

Even though this printer has a low price, it has many of the word processing features found on more expensive printers. They include bold and double print, underline, subscript, and superscript.

### **FEATURES FOR GRAPHICS**

There are no graphics features.

### **INSTALLATION AND INTERFACING**

The RO comes with parallel or serial interfaces. For software installation and

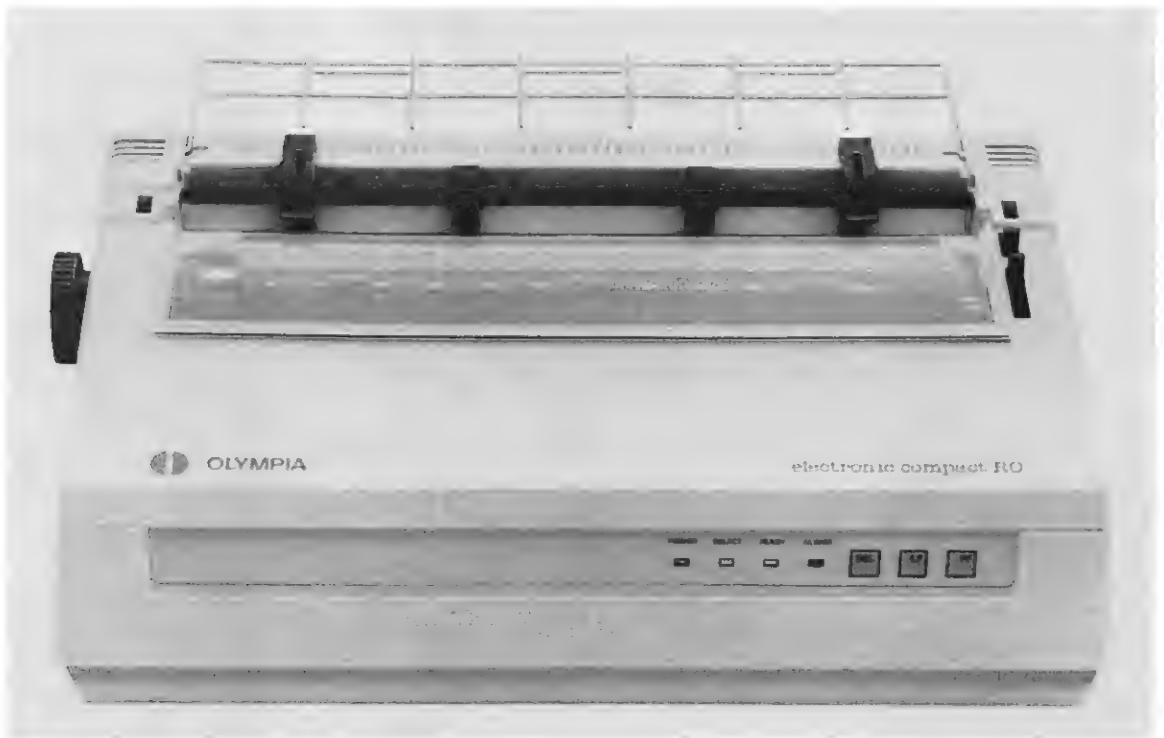


Fig. 6-1. The Olympia Electronic Compact RO is a good-quality, low-cost, daisy-wheel printer (courtesy of Olympia USA, Inc.).  
compatibility, the RO emulates the Diablo 630 protocol.

### QUALITY AND PERFORMANCE

This is a very quiet printer, but it is not a heavy-duty one. If you want a heavy-duty printer, then you may be disappointed with the Olympia Electronic Compact RO.

One problem we discovered when using this printer, was the pin-tractor feeder. It makes it very difficult to get the paper lined up inside the printer.

### VENDOR SUPPORT

This printer has a 90-day warranty. There are local service centers across the country.

---

## Power Type

\$499.00

Star Micronics

### RATINGS

B Overall rating

A Price/performance

### FEATURES

Speed:

18 cps

Bidirectional:

+

## **RATINGS**

B Software compatibility  
B Ease of installation  
B Documentation  
B Vendor support

## **FEATURES**

Logic-seeking:	+
Centronics	
parallel:	+
Serial:	+
Friction feed:	+
Pin feed:	+
Characters per	
line:	110, 132, 165
Paper size:	to 8 1/2" wide

## **PRODUCT SUMMARY**

Power Type is a low-cost, daisy-wheel, letter-quality printer. At 18 cps its speed is moderate, and it is slightly faster than some of its more expensive competitors. Type may be 10, 12 or 15 cpi, with over 100 different font wheels available. Two functional modes are available—standard and word processing (which accepts commands in the format of the Qume printer).

## **FEATURES FOR WORD PROCESSING**

Power Type offers all the features of the Qume printer in its word processing mode. Proportional spacing is also supported.

## **FEATURES FOR GRAPHICS**

Diagrams, charts, etc. can be created using the graphics mode.

## **INSTALLATION AND INTERFACING**

This printer comes with a parallel and serial interface.

## **QUALITY AND PERFORMANCE**

Power Type does an adequate job. It is relatively slow and noisy, but no more so than other letter-quality printers in this price range. For \$499, it is an excellent buy for low-volume letter-quality printing.

## **VENDOR SUPPORT**

There is a 1-year warranty on parts and labor. Technical assistance is available through the manufacturer or local distributors.

# Style Writer

\$899.00

Data Terminals & Communications

## RATINGS

- A Overall rating
- B Price/performance
- B Software compatibility
- A Ease of installation
- A Documentation
- A Vendor support

## FEATURES

Speed:	20 cps
Bidirectional:	+
Logic-seeking:	+
Centronics	
parallel:	+
Serial:	-
Friction feed:	+
Pin feed:	-
Characters per	
line:	177
Paper size:	to 17 3/4"
	wide

## PRODUCT SUMMARY

The Style Writer is excellent and loaded with features (Fig. 6-2). It is bidirectional in the text mode. It also comes with a standard 35K buffer to hold some 20 pages of text, which can be reprinted using the COPY switch. A 67K buffer is optional. Another option is a keyboard which can be used as a typewriter. A large variety of print wheels are available. The Style Writer is compatible with the Diablo 1640/1650 software.

## FEATURES FOR WORD PROCESSING

For word processing applications, there are many features, such as automatic proportional spacing; shadow print and double-strike modes; auto underline; superscript and subscript, and programmable pitch, which also has a switch control. Some features may be selected from the printer control codes or through DIP switch settings, including print formatting features (margins, spacing, and paper length) and foreign language character sets.

## FEATURES FOR GRAPHICS

Graphs and charts for reports can be created by using the plot mode to move the print head around.

## INSTALLATION AND INTERFACING

This printer comes with a parallel interface and is compatible with Diablo 1640/1650 software.



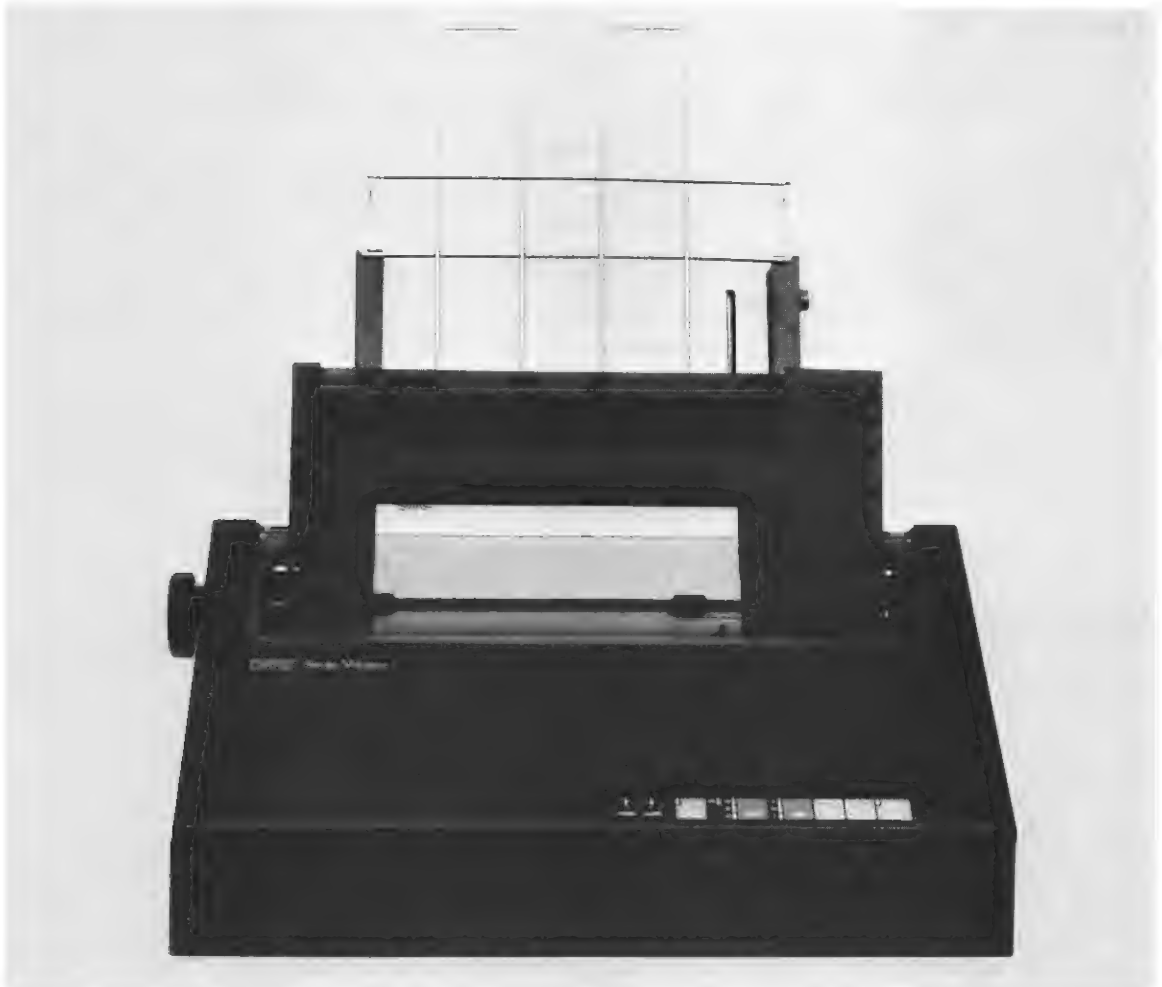


Fig. 6-2. The Style Writer is an excellent daisy-wheel printer for the Apple II family (courtesy of Data Terminal & Communications).

### **QUALITY AND PERFORMANCE**

The Style Writer is a very good printer. The word processing features are impressive. It uses the Brother print wheel, which expands its capabilities. The 35K buffer is very useful for word processing applications, and the sheet feeder option saves a lot of time and energy. The graphics, although limited, would enhance any report with graphs and charts. DTC is known for its long-lasting and reliable products.

### **VENDOR SUPPORT**

There is a 90-day warranty on parts and labor. Technical support is available through an 800 number.

## **Transtar 120**

Parallel—\$378.00

Vivitar Computer Products, Inc.

Serial —\$328.00

### **RATINGS**

B Overall rating  
A Price/performance  
B Software compatibility  
A Ease of installation  
C Documentation  
B Vendor support

### **FEATURES**

Speed:	14 cps
Bidirectional:	+
Logic-seeking:	+
Centronics	
parallel:	+
Serial:	—
Friction feed:	+
Pin feed:	—
Characters per	
line:	101 to 151
Paper size:	to 12" wide

### **PRODUCT SUMMARY**

The Transtar 120 is called portable because it is light and easy to move around. It is bidirectional, logic-seeking, and low-priced.

### **FEATURES FOR WORD PROCESSING**

To fully utilize the word processing features, configure your software for the Diablo 1610/1620 protocol, which is compatible with this printer. Select print pitch (10, 12, or 15 cpi), autoloading, and auto line feed with the DIP switches. The autoloading function automatically feeds the paper to a predetermined line for printing. With software support other features are available, including boldface, underline, superscript, and subscript. By using escape sequences or appropriate software, you can also control the horizontal and vertical print positions, tabs, line feed, and the forward and backward print modes.

### **FEATURES FOR GRAPHICS**

A limited graphics mode is available through your program which allows you to create graphs and charts by controlling the movement of the carriage both vertically (1/48") and horizontally (1/120").

### **INSTALLATION AND INTERFACING**

This printer is available in both parallel and serial interface versions.

### **QUALITY AND PERFORMANCE**

The print quality is good, and the unit is conveniently lightweight and compact. These qualities make the Transtar 120 a good value.

## **VENDOR SUPPORT**

There is a 6-month warranty on parts and labor. Technical support is available through local dealers.

---

### **Transtar 130**

Serial—\$448.00

Vivitar Computer Products, Inc.

Parallel—\$478.00

#### **RATINGS**

B Overall rating  
B Price/performance  
B Software compatibility  
A Ease of installation  
C Documentation  
B Vendor support

#### **FEATURES**

Speed:	18 cps
Bidirectional:	+
Logic-seeking:	+
Centronics	
parallel:	+
Serial:	+
Friction feed:	+
Pin feed:	-
Characters per	
line:	150, 180
Paper size:	to 17" wide

#### **PRODUCT SUMMARY**

The Transtar 130 is the wide-carriage version of the Transtar 120. It is bidirectional and logic-seeking. The Transtar 130 is compatible with the Diablo 1610/1620 protocol. There are eight print wheels available for special applications and a 2K buffer with the serial interface. Tractor feed is available as an option.

#### **FEATURES FOR WORD PROCESSING**

For word processing applications, Vivitar has built in a wide array of features. Configure your software for the Diablo protocol to make full use of them. DIP switches are used for print pitch (10 or 12 cpi, proportional spacing), autoloader (feeds paper to a predetermined line automatically), and auto line feed. Also included are boldface, underline, superscript, and subscript. An optional tractor feed is required to access these last two functions. Send the appropriate escape sequences to control the horizontal and vertical print positions (tabs, line feed, backward and forward print modes).

When called for, select the Diablo option or the universal parallel printer option in that order.

#### **FEATURES FOR GRAPHICS**

Select the limited graphics mode through your program to control the horizon-

tal and vertical movement of the carriage to create graphs and charts.

## **INSTALLATION AND INTERFACING**

This printer comes in both parallel and serial versions.

## **QUALITY AND PERFORMANCE**

The Transtar 130 has good print quality and offers most features that come with daisy-wheel printers. We recommend this unit for light use.

## **VENDOR SUPPORT**

There is a 6-month warranty on parts and labor. Technical support is available from local dealers.

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## **TTX-1014**

\$499.00

Teletex Communications Corp.

### **RATINGS**

B Overall rating  
B Price/performance  
B Software compatibility  
B Ease of installation  
C Documentation  
B Vendor support

### **FEATURES**

Speed:	14 cps
Bidirectional:	+
Logic-seeking:	+
Centronics	
parallel:	+
Serial:	+
Friction feed:	+
Pin feed:	+
Characters per	
line:	115 to 173
Paper size:	to 14 7/8"
	wide

## **PRODUCT SUMMARY**

The TTX-1014 printer is bidirectional and logic-seeking. Friction feed and pin feed are standard. An optional cut sheet feeder which holds up to 250 sheets is available from the manufacturer.

## **FEATURES FOR WORD PROCESSING**

For word processing applications, the TTX-1014 offers many features. Character pitch can be selected from a program or a switch, and you can choose from 10, 12, or 15 cpi. For special print effects, there are boldface, shadow print, full line and word underline, superscript, and subscript. Use escape sequences for print func-

tions such as line space, carriage return, form feed, and backspace. For word processing settings, you could use the interface from a dot-matrix printer. If you are able to send escape sequences through the program to access special print functions, most word processing programs will work with this printer. Teletex offers a number of different types of print wheels.

### **FEATURES FOR GRAPHICS**

The manual does not mention graphics; however you can create limited graphics by using the print action control commands.

### **INSTALLATION AND INTERFACING**

Both serial and parallel interfaces are standard with the TTX-1014.

### **QUALITY AND PERFORMANCE**

Although the print quality is good, this printer lacks some important features for both word processing and graphics. There is no proportional spacing or a plot mode.

### **VENDOR SUPPORT**

There is a 30-day warranty on parts and labor. Technical support is available through an 800 number.

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## **WORKSHEET FOR FULLY-FORMED-CHARACTER PRINTERS**

### **PRODUCT**

\$

### **MANUFACTURER**

#### **RATINGS**

Overall rating  
Price/performance  
Software compatibility  
Ease of installation  
Documentation  
Vendor support

#### **FEATURES**

Speed:  
Bidirectional:  
Logic-seeking:  
Centronics  
parallel:  
Serial:  
Friction feed:  
Pin feed:  
Characters per  
line:  
Paper size:

## PRODUCT SUMMARY

### FEATURES FOR WORD PROCESSING

### FEATURES FOR GRAPHICS

### INSTALLATION AND INTERFACING

### QUALITY AND PERFORMANCE

### VENDOR SUPPORT

Table 6-1. Comparative Ratings for Fully-Formed-Character Printers.

PRINTER	PRICE	RATINGS					
		1	2	3	4	5	6
Apple Daisy Wheel	\$2195.00	A	C	B	A	A	B
CR-II (parallel)	599.00	A	A	B	A	B	B
CR-II (serial)	649.00	A	A	B	A	B	B
CR-III (parallel)	995.00	A	A	B	B	B	B
CR-III (serial)	1045.00	A	A	B	B	B	B
Diablo 630 ECS	2529.00	A	A	A	B	A	B
DX-15	499.00	A	A	B	A	B	B
EXP-500	549.00	B	B	B	A	B	B
F10 Printmaster	1995.00	B	A	B	B	B	A
F10 StarWriter	1795.00	B	A	B	B	B	A
HR25	845.00	A	A	B	B	B	B
Juki Model 6100 (parallel)	599.00	B	C	B	B	B	B
Juki Model 6100 (serial)	758.00	B	C	B	B	B	B
NEC 2050 Spinwriter	925.00	A	A	B	B	A	A
NEC 3550 Spinwriter	1750.00	A	A	A	B	B	A
Olympia ESW 3000	1899.00	B	B	B	B	B	B
Olympia Electronic Compact RO	649.00	B	A	B	C	B	B
Power Type	499.00	B	A	B	B	B	B
Style Writer	899.00	A	B	B	A	A	A
Transtar 130 (parallel)	478.00	B	B	B	A	C	B
Transtar 130 (serial)	448.00	B	B	B	A	C	B
Transtar 120 (parallel)	378.00	B	A	B	A	C	B
Transtar 120 (serial)	328.00	B	A	B	A	C	B
TTX-1014	499.00	B	B	B	B	C	B
KEY TO RATINGS							
1—Overall rating		4—Ease of installation					
2—Price/performance		5—Documentation					
3—Software compatibility		6—Vendor support					

**Table 6-2. Comparative Features for Fully-Formed-Character Printers.**

PRODUCT	FEATURES									
	1	2	3	4	5	6	7	8	9	10
Apple Daisy Wheel	D 40	+	+	-	+	+	+		198	15
CR-II	D 12	+	+	+	+	+	-		110	13.5
CR-III	D 23	+	+	+	+	+	-		132	14 7/8
Diablo 630 ECS	D 40	+	+	+	-	+	-		132	13.2
DX-15	D 13	+	+	+	+	+	-		110	13.5
EXP-500	D 16	+	+	+	+	+	-		132	13.2
F-10 Printmaster	D 55	+	+	+	+	+	-		136	15
F-10 StarWriter	D 40	+	+	+	+	+	-		136	15
HR 25	D 23	+	+	+	+	+	-		165	16.5
Juki Model 6100	D 18	+	+	+	+	+	+		100	11
NEC 2050										
Spinwriter	D 20	+	+	+	-	+	+		136	13.6
NEC 3550										
Spinwriter	D 33	+	+	+	-	+	-		136	16
Olympia ESW 3000	D 50	+	+	+	+	+	+		150	17
Olympia Electronic										
Compact RO	D 14	+	+	+	+	+	+		115	14.4
Power Type	D 18	+	+	+	+	+	+		110	8.5
Style Writer	D 20	+	+	+	-	+	-		177	17 3/4
Transtar 130	D 18	+	+	+	+	+	-		150	17
Transtar 120	D 14	+	+	+	-	+	-		101	12
TTX-1014	D 14	+	+	+	+	+	+		115	14 7/8
<b>KEY TO FEATURES</b>										
1—Type (D=Daisy-wheel)										
2—Speed (characters per second)										
3—Bidirectional										
4—Logic-seeking										
5—Centronics parallel										
6—Serial										
7—Friction feed										
8—Pin feed										
9—Characters per line										
10—Paper size (inches)										

# Chapter 7



## Interface Cards

In order to connect your Apple with a printer or an external modem, you need an interface card. The type of card you need depends on the type of device you wish to connect to your Apple.

The interface allows the printer to use a particular standard. These standards will allow you to connect almost any computer to any printer. They also specify how to transfer information as well as the type of cable and plug needed for connection.

The most common data format used in the industry for character and command representation is the American Standard Code for Information Interchange (ASCII). The three hardware standards are the RS-232C serial, the Centronics parallel, and the IEEE-488 parallel standards.

Standards are used for the "handshaking" signals and for the protocol. In order for two machines made by different manufacturers to work together, they must have the same protocol.

The RS-232C is a serial interface for transmission. It designates the specific voltage levels, the required driver, and the receiver characteristics for 21 circuits. Information moves sequentially, bit by bit, between the computer and the printer. Serial transmission can be somewhat slow because of the need to split each byte into its 7 or 8 bits and then recombine it after it has been received. Even at a relatively slow transmission rate of 240 characters per second, however, most printers cannot keep up. Thus, it is usually printer speed, rather than interface transmission speed, that limits how fast printing is accomplished.

The serial connection involves 25 different wires, each having a defined use. In most uses for printers and modems, however, not all 25 are needed.



The parallel Centronics-type interface uses 36 different wires which send 7- or 8-bit bytes of information simultaneously. This method is much quicker than the serial interface. The other wires are used for the handshaking signals. Centronics is a printer manufacturer and was an early user of the parallel transmission; hence, its name has been given to the standard.

Some printers come with only one type of interface, either parallel or serial. For example, the Apple Imagewriter and Scribe printers come only with a serial interface. Others come in either a serial or a parallel version—you select which form when you buy the printer. In some cases, the serial interface version costs a bit more than the parallel version. Finally some printers, such as the Star Micronics Power Type, come with both a serial and a parallel interface built in. You can connect to either type of interface card, and you merely need to set a DIP switch to let the printer know which interface connection to use.

By contrast, almost all external modems require not only a serial interface but a specific type of serial interface, namely the EIA RS-232C.

Another consideration in the use of the interface is the cable connection between the interface card and the printer or modem. Obviously you need to be certain that the cable is long enough to reach from your computer to the peripheral device. In the case of a printer, you may well want it to be some distance from the computer so that its noise will not be too oppressive. You should be aware, however, that long cables are quite expensive, and some electrical signals can be lost over a very long cable. Unshielded cables can also emit RFI (radio frequency interference), messing up any television reception in the nearby area.

Centronics printer cables consist of 36 wires, each of which carries an important signal. By contrast, the serial printer cable usually does not require more than 4 of its 25 wires to be connected—data set ready and data ready handshaking lines, signal ground, and send data. Indeed, on the Apple *I*Ic port there are only five output/input lines; the additional line is receive data (used in modem connections). The 25-pin connector used to connect the serial cable to the serial printer or modem is known as a *DB-25 connector*.

The Apple *I*Ic does not require interface cards for a printer or a modem; indeed there is no place to put a card. Instead, it has two ports on the rear of its case. One port, with a printer icon above it, is meant for connection to a serial printer. The other port, with a telephone icon, is designed for connection to a modem. The ports require a special cable with a DIN-5 connector on one end for connection to the Apple *I*Ic and a DB-25 connector on the other end for connection to the printer or modem.

Users of the Apple *I*Ic, however, are not required to use a serial printer. Several companies manufacture serial-to-parallel adaptors which convert the serial output of the Apple *I*Ic's ports to a parallel signal that can be used by a Centronics-compatible printer. These adaptors are reviewed in this chapter.

Many printers have graphics capabilities; that is, they can print a replica of the Apple graphics screen or otherwise print pictures using a series of dots. These printers, however, generally need software command to tell them to print the picture, and they usually require special programming to convert the representation of the Apple graphics screen to a printed picture. While this can be a complicated

process, many interface cards have built-in commands which automatically do the conversion. This process is referred to as *graphics dump capability*. Cards vary as to whether they can dump high-resolution graphics, double high-resolution graphics (available on the Apple IIc and the Apple IIe with an extended 80-column card), and low-resolution graphics.

Some interface cards also have the ability to duplicate the currently displayed Apple text screen on the printer. Some can dump only the 40-column-wide (standard) text screen. Others can dump the 80-column-wide text screen displayed with 80-column cards. Most cards which can dump the 80-column-wide text screen can only dump the text from certain (usually Apple) 80-column cards.

Another difference between cards is whether they will work with only one particular printer or a wide variety of printers. As a general rule, the more features the particular card has, the more likely it is to work only with one or a small group of printers.

Those cards which work with a variety of printers require that you use one of several methods of indicating which printer you have attached to the card. Some have you run a setup program from a supplied software disk which writes the configuration into nonvolatile memory. Others have you set DIP switches to indicate the particular printer.

Some printer interface cards provide special type fonts or custom characters for use on the printer. This feature is usually found on cards which are printer specific.

A final feature found on some printer interface cards is extra RAM, used as a printer buffer. Buffers vary in size from 16K to over 64K (or from approximately 9 double-spaced pages to over 37 pages).

---

## Alphabits Printer Interface

\$119.95

Street Electronics Corporation

### RATINGS

B Overall rating  
B Price/performance  
B Software compatibility  
A Ease of installation  
B Documentation  
B Vendor support

### FEATURES

Serial/parallel:	S
Graphics dump:	H (software)
Text dump:	40
ProDOS compatible:	+
CP/M compatible:	-
p-System compatible:	+
Printer specific:	No
Special fonts/typefaces:	-
Nonvolatile memory:	-
Buffer size:	0

### PRODUCT SUMMARY

The Alphabits is one of the newest in the series of hardware devices which

enables one type of Apple to emulate another type. In this case, the Alphabits card permits the Apple II, II+, or IIe to emulate the serial port of the Apple IIc. Since the serial port of the IIc is a modified version of the Apple Super Serial Card, the Alphabits card is mostly compatible with that card as well.

One additional difference between the Alphabits card and the Apple Super Serial Card is that the Alphabits card comes with an Apple IIc-compatible connector (DIN-9) rather than a standard DB-25 connector. You must, therefore, use an Apple IIc-compatible cable with the card.

The card also comes with Street Electronic's Graphicbits software, which permits you to draw high-resolution graphics shapes, fill patterns, and edit high-resolution graphics character sets. The software also contains commands to dump either the text or high-resolution graphics screen. Unfortunately, this means the software must be active before you can do the dump, unlike the cards with built-in (ROM resident) firmware commands.

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## APIC Printer Interface

Plain—\$ 95.00

Quadram Corporation

Color Graphics—\$105.00

### RATINGS

B Overall rating  
A Price/performance  
B Software compatibility  
B Ease of installation  
B Documentation  
B Vendor support

### FEATURES

Serial/parallel:	P
Graphics dump:	H
Text dump:	40
ProDOS compatible:	+
CP/M compatible:	+
p-System compatible:	+
Printer specific:	Yes
Special fonts/typefaces:	—
Nonvolatile memory:	—
Buffer size:	0

### PRODUCT SUMMARY

The APIC comes in two versions—a standard model and a color graphics model for use with the Quadjet color ink-jet printer. Various versions of the card are designed for specific printers. You should check with the manufacturer to be sure that a version will work with your printer and which version you should get.

Firmware supports a text screen dump in 40-column mode. The card does not support 80-column text screen dumps and, indeed, is incompatible with some 80-column cards and other peripherals. Other text mode commands include adjustable margins, page length, and line length. Automatic generation of line feeds with carriage returns can be optionally set.

A nice feature of the APIC, in text mode, is the automatic right margin feature. When enabled, it breaks lines between words rather than splitting a word at the end of the line, a process similar to the word wrap feature found in most word pro-

cessors. It is useful for automatic formatting when writing output from your own programs.

Graphics dump features include dumping page 1 or page 2 of the high-resolution graphics screen, emphasized or normal, enlarged or regular, rotated, and inverted or regular.

Some graphic applications require that an interface card be able to pass a full 8 bits of data. Many cards only transmit 7 bits, stripping off the high bit. APIC transmits all 8 bits under software control.

---

## **AP-830 Serial-to-Parallel Converter**

**\$79.00**

Quentin Research, Inc.

### **RATINGS**

A Overall rating  
A Price/performance  
A Software compatibility  
A Ease of installation  
B Documentation  
A Vendor support

### **FEATURES**

### **PRODUCT SUMMARY**

The Quentin serial-to-parallel converter allows the Apple *IIfx* to use parallel devices, particularly parallel printers. The AP-830 does not require an external power source.

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## **Dispatcher Printer Interface**

**\$139.00**

Advanced Logic Systems

### **RATINGS**

B Overall rating  
B Price/performance  
B Software compatibility  
A Ease of installation  
B Documentation  
A Vendor support

### **FEATURES**

Serial/parallel:	S
Graphics dump:	-
Text dump:	-
ProDOS compatible:	+
CP/M compatible:	+
p-System compatible:	+
Printer specific:	No
Special fonts/typefaces:	-
Nonvolatile memory:	-
Buffer size:	0

### **PRODUCT SUMMARY**

The Dispatcher is a serial interface card for the Apple II, II+, and *IIfx*. It is

designed both for serial printer and modem interfacing. It provides simultaneous RS-232C output and screen echo, and comes with a full 25-pin DB-25 cable carrying all the RS-232C signals.

The card will communicate at seven different baud rates from 110 to 19,200. It supports optional automatic line feed generation. It follows the Apple II firmware and I/O device protocol so that it should be compatible with most software written for the Apple.

The card carries a 1-year limited warranty.

---

## Graphicard Printer Interface

\$99.00

### Practical Peripherals

#### RATINGS

A Overall rating  
B Price/performance  
A Software compatibility  
A Ease of installation  
A Documentation  
A Vendor support

#### FEATURES

Serial/parallel:	P
Graphics dump:	H
Text dump:	40/80
ProDOS compatible:	+
CP/M compatible:	+
p-System compatible:	+
Printer specific:	No
Special fonts/typefaces:	-
Nonvolatile memory:	-
Buffer size:	0

#### PRODUCT SUMMARY

The Graphicard is a parallel text and graphics interface card for some 39 different printers, including Epson, Anadex, IDS, Okidata, Mannesmann-Tally, Star, NEC, C-Itoh, and Apple. It features the same text features as the Printerface.

Graphics dump options include dumping either page 1 or page 2 of the high-resolution graphics display, dumping page 1 and 2 together either side by side or top to bottom, rotation, mixed with text, emphasized, or inverted.

---

## Hamlet Serial-to-Parallel Converter

\$98.50

### Belkin Components

#### RATINGS

A Overall rating  
A Price/performance  
A Software compatibility  
B Ease of installation  
A Documentation  
B Vendor support



Fig. 7-1. The Hamlet allows the Apple IIc to use parallel devices (courtesy of Belkin Components).

## PRODUCT SUMMARY

The Belkin serial-to-parallel converter allows the Apple IIc to use parallel devices, particularly parallel printers. The Hamlet requires a separate external power source, which makes it slightly awkward to use. See Fig. 7-1.

---

<b>Microbuffer II + Printer Interface</b>	16K—\$259.00
Practical Peripherals	32K—\$299.00
	64K—\$349.00

## RATINGS

B Overall rating  
 B Price/performance  
 B Software compatibility  
 A Ease of installation  
 B Documentation  
 A Vendor support

## FEATURES

Serial/parallel:	S or P
Graphics dump:	H
Text dump:	—
ProDOS compatible:	+
CP/M compatible:	+
p-System compatible:	+
Printer specific:	No
Special fonts/typefaces:	—
Nonvolatile memory:	—
Buffer size:	16K to 64K

## PRODUCT SUMMARY

The Microbuffer II + is a printer interface card which comes with a printer buffer on the card. The buffer varies in size from 16K to 64K. The Microbuffer II + only occupies one slot in the Apple motherboard unlike some buffered printer cards

which require one slot for the interface and one slot for the buffer.

The card has both text formatting and a high-resolution graphics dump.

The card comes in either a serial or a parallel form. You can select a card as both serial and parallel for an additional \$59.00. The card is covered by a 5-year warranty.

---

## Microbuffer II Printer Interface

16K—\$199.00

Practical Peripherals

32K—\$219.00

### RATINGS

B Overall rating  
B Price/performance  
B Software compatibility  
A Ease of installation  
B Documentation  
A Vendor support

### FEATURES

Serial/parallel:	S or P
Graphics dump:	H
Text dump:	—
ProDOS compatible:	+
CP/M compatible:	+
p-System compatible:	+
Printer specific:	No
Special fonts/typefaces:	—
Nonvolatile memory:	—
Buffer size:	16K to 32K

### PRODUCT SUMMARY

The Microbuffer II is a printer interface card which comes with a printer buffer on the card. The buffer varies in size from 16K to 32K. The Microbuffer II only occupies one slot in the Apple motherboard, unlike some cards which require one slot for the interface and one slot for the buffer.

The card has both text formatting and a high-resolution graphics dump in the parallel version only.

The card comes in either a serial or a parallel form. Printers which can be connected to the card include Anadex, Apple, Epson, NEC, IDS, C-Itoh, Prowriter, and Okidata printers. The card is covered by a 5-year warranty.

---

## Nice Print Printer Interface

\$175.00

Spies Laboratories

### RATINGS

B Overall rating  
B Price/performance  
B Software compatibility  
A Ease of installation

### FEATURES

Serial/parallel:	P
Graphics dump:	H
Text dump:	40
ProDOS compatible:	+

## RATINGS

- A Documentation
- B Vendor support

## FEATURES

CP/M compatible:	+
p-System compatible:	+
Printer specific:	Partially
Special fonts/typefaces:	+
Nonvolatile memory:	-
Buffer size:	0

## PRODUCT SUMMARY

Nice Print is a general parallel printer interface card and a special feature card. It prints your text in up to 5 specialized fonts nearly like a daisy-wheel in quality. Font styles include Roman, which comes with the card, and Letter Gothic, Orator Lage, Script, and Old English. These latter fonts come either two (\$30.00) or four (\$49.00) on an EPROM to be plugged onto the card. Six different character sizes are supported: 5, 6, 8 1/2, 10, 12, and 17 characters per inch. Printing is supported in boldface, underline, superscript, and subscript even if scripting is not normally supported on your printer.

When using the specialized fonts, printing speed degrades by a factor of 6. If you want to bypass the special features of the Nice Print card, you can print with it as though it was a normal printer interface. Graphics dumps, either page 1, page 2, or both pages side by side, support either normal, double sized, emphasized, rotated, or combined with text. A text screen dump is also built into the interface card.

Nice Print works on the Epson MX printers with Grafrax Plus, Epson RX and FX, Gemini, Apple, NEC, and C-Itoh printers. The card comes with a 30-page manual and is covered by a 90-day warranty.

---

## Parallel Interface Card *I/e*

\$165.00

Apple Computer, Inc.

## RATINGS

- B Overall rating
- B Price/performance
- A Software compatibility
- A Ease of installation
- A Documentation
- B Vendor support

## FEATURES

Serial/parallel:	P
Graphics dump:	-
Text dump:	-
ProDOS compatible:	+
CP/M compatible:	+
p-System compatible:	+
Printer specific:	No
Special fonts/typefaces:	-
Nonvolatile memory:	-
Buffer size:	0

## PRODUCT SUMMARY

The Parallel Interface card *I/e* is the "standard" Centronics parallel printer in-



terface for the Apple II, II+, and IIe. It is not needed with the IIc. It will connect to any Centronics-compatible printer with an appropriate cable.

As would be expected, it follows the Apple II firmware and I/O device protocol; so it should be compatible with most software written for the Apple. The interface will allow optional generation of a line feed with a carriage return.

---

## **Pkaso/U Printer Interface**

\$175.00

Interactive Structures, Inc.

### **RATINGS**

A Overall rating	Serial/parallel:	P
A Price/performance	Graphics dump:	L/H
A Software compatibility	Text dump:	40/80
A Ease of installation	ProDOS compatible:	+
A Documentation	CP/M compatible:	+
B Vendor support	p-System compatible:	+
	Printer specific:	No
	Special fonts/typefaces:	+
	Nonvolatile memory:	+
	Buffer size:	0

### **PRODUCT SUMMARY**

The Pkaso/U (the U stands for universal) card will interface with any Centronics-compatible parallel printer. A one-time setup must be done to place the necessary codes for your printer in the nonvolatile memory on the card. You can also define your own control codes rather than accept those which come predefined with the card.

As would be expected from an interface card whose name sounds like Picasso, the graphics capabilities of the card are outstanding. It will do normal high-resolution and low-resolution graphics screen dumps, including color graphics dumps for color printers. The graphics image can be rotated in four positions: 90, 180, 270, and 360 degrees. Most graphics rotation only allows two modes: 90 and 360.

Graphics printing can be normal or inverted, and the picture can be stretched either horizontally or vertically. Either the entire screen or a portion of it can be printed. For low-resolution graphics (and other uses), the card uses a 16-level gray scale. It will also support graphics images at the maximum printer resolution instead of the relatively coarse 192 × 280 resolution of the Apple graphics screen. Most printers are capable of resolution two to four times finer.

You can define your own typefaces or special characters. The text screen dump permits margin specification and allows you to either dump the standard 40-column text screen or the 80-column screen on the Apple IIc or the IIe with an Apple 80-column card.

Pkaso/U comes with a manual and reference card, a software tutorial, and a four-foot cable.

## Printerface Printer Interface

\$75.00

### Practical Peripherals

#### RATINGS

A Overall rating  
A Price/performance  
A Software compatibility  
A Ease of installation  
A Documentation  
A Vendor support

#### FEATURES

Serial/parallel:	P
Graphics dump:	H
Text dump:	40/80
ProDOS compatible:	+
CP/M compatible:	+
p-System compatible:	+
Printer specific:	No
special	
fonts/typefaces:	-
Nonvolatile memory:	+
Buffer size:	0

#### PRODUCT SUMMARY

The Printerface is a basic parallel printer interface with a number of advanced features. High-resolution graphics dump routines for a specific printer can be added as part of an upgrade kit. The standard text formatting commands are built in, as is a 40-column text screen dump mode. An 80-column dump mode is also supported on the Apple *IIfx* using an Apple 80-column card.

Printer output can be echoed to the screen or not, under software selection. With an Apple *IIfx* and an Apple 80-column card, the echoing of output can be to the 80-column screen.

Some graphic applications require that an interface card be able to pass a full 8 bits of data. Many cards only transmit 7 bits, stripping off the high bit. Printerface transmits all 8 bits under software control.

The card features a transparent, or *dumb*, printing mode in which the card emulates a standard, featureless card. A self-test is included with the card. The Printerface is covered by a 5-year warranty.

---

## PrinterMate Printer Interface

\$99.00

### Advanced Logic Systems

#### RATINGS

B Overall rating  
B Price/performance  
B Software compatibility  
A Ease of installation  
B Documentation  
A Vendor support

#### FEATURES

Serial/parallel:	P
Graphics dump:	-
Text dump:	-
ProDOS compatible:	+
CP/M compatible:	+
p-System compatible:	+

## FEATURES

Printer specific:	No
Special fonts/typefaces:	-
Nonvolatile memory:	-
Buffer size:	0

## PRODUCT SUMMARY

The PrinterMate is a standard parallel printer interface with a few nice, added touches. It works with the Apple II, II+, or IIe in slot 1. It will connect to any Centronics-compatible printer with the supplied 8-foot cable. The extra length of the supplied cable is a convenience for many computer setups.

It follows the Apple II firmware and I/O device protocol; so it should be compatible with most software written for the Apple. The PrinterMate will allow optional generation of a line feed with a carriage return.

Some graphic applications require that an interface card be able to pass a full 8 bits of data. Many cards only transmit 7 bits, stripping off the high bit. PrinterMate transmits all 8 bits under software control.

The card also has a self-test built into it.

---

## Print-It Printer Interface

Model 1—\$199.00

Textprint

Model 2—\$149.00

## RATINGS

B Overall rating  
B Price/performance  
A Software compatibility  
A Ease of installation  
B Documentation  
B Vendor support

## FEATURES

Serial/parallel:	S/P
Graphics dump:	L/H/D
Text dump:	40/80
ProDOS compatible:	+
CP/M compatible:	+
p-System compatible:	+
Printer specific:	No
Special fonts/typefaces:	-
Nonvolatile memory:	-
Buffer size:	0

## PRODUCT SUMMARY

Print-It is a graphics and text dump printer interface with a wide variety of screen dump options. Model 1 comes with a button that permits you to interrupt any running program and dump the current screen to the printer. Model 2 permits dumps, but without the program interruption feature.

Screen dumps supported include low-resolution graphics, high-resolution graphics, double low-resolution graphics, double high-resolution graphics, color graphics to IDS Prism Printers, 40-column text, and 80-column text from either an Apple or Videx 80-column card.

Graphics and text dumps can be made of either page 1 or page 2, either separately or side by side. Graphics can be single or double sized, rotated, inverted, or emphasized. Graphics can be mixed with either 40- or 80-column text and either centered or left justified. Continuous printed graphics ("banner printing") is also supported. You can print 40-column text in double wide letters.

Some graphic applications require that an interface card be able to pass a full 8 bits of data. Many cards only transmit 7 bits, stripping off the high bit. Print-It transmits all 8 bits under software control.

The card has a special dump card mode that permits it to emulate nonintelligent printer interface cards needed by some applications software.

Printer selection is made by means of DIP switches on the interface card. Printers supported include the Imagewriter, Apple Dot Matrix Printer, C-Itoh, Epson, IDS, Mannesmann-Tally, NEC dot-matrix, NEC Spinwriter, Okidata, ProWriter, Star Gemini, Transtar, and most daisy-wheel printers.

---

## PSIO Printer Interface

\$229.00

Videx Inc.

### RATINGS

A Overall rating  
B Price/performance  
B Software compatibility  
A Ease of installation  
A Documentation  
A Vendor support

### FEATURES

Serial-parallel:	S/P
Graphics dump:	H
Text dump:	-
ProDOS compatible:	+
CP/M compatible:	+
p-System compatible:	+
Printer specific:	No
Special fonts/typefaces:	-
Nonvolatile memory:	+
Buffer size:	0

### PRODUCT SUMMARY

The PSIO interface has independent parallel and serial output. It provides a high-resolution graphics dump through on-card firmware, including a color dump to the IDS Prism color printer. The graphics dump includes the "normal" rotate, enlarge, and invert functions.

Dual output is supported by permitting one of the two outputs to be directed to a second slot. For example, if you have the PSIO in slot 1 and slot 2 is empty, you can direct the parallel printer output to slot 1 and the serial printer output to slot 2. This function is referred to as a *phantom slot function*.

Setting the card for your particular printer is quite easy. You merely run the setup program, make the selections, press the button on the card, and the nonvolatile RAM memory on the card will hold that configuration until you wish to change it. No battery backup is needed.

Output options available for the card include baud rate selection (for serial output), forms width and length, auto line feed on/off, Xon/Xoff protocol (for serial output), data format (high bit on/off), and echoing output to the screen.

The parallel output is fully Centronics compatible. The serial output is RS-232C standard with 15 baud rates from 50 to 19,200 baud and either half or full duplex.

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## Serial to Parallel Adaptor

\$129.95

Discwasher

### RATINGS

- A Overall rating
- B Price/performance
- A Software compatibility
- A Ease of installation
- B Documentation
- A Vendor support

### PRODUCT SUMMARY

The Discwasher Serial to Parallel Adaptor allows the Apple IIc to use a parallel device, particularly parallel printers. It does not require an external power source.

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## Seriall Printer Interface

\$159.00

Practical Peripherals

### RATINGS

- B Overall rating
- B Price/performance
- A Software compatibility
- A Ease of installation
- A Documentation
- A Vendor support

### FEATURES

Serial/parallel:	S
Graphics dump:	H
Text dump:	-
ProDOS compatible:	+
CP/M compatible:	+
p-System compatible:	+
Printer specific:	No
Special fonts/typefaces:	-
Nonvolatile memory:	-
Buffer size:	0

### PRODUCT SUMMARY

The Seriall is a serial communications card and printer interface for serial printers. The interface is an RS-232C standard interface, which supports both text and graphics output for 35 different printers.

Graphics dump options include dumping either page 1 or page 2 of the high-

resolution graphics display; dumping page 1 and 2 together, either side by side or top to bottom; rotation; mixed with text; emphasized, or inverted.

Like all printer interface cards from Practical Peripherals, the card comes with a 5-year warranty.

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## **Super Serial Card //e Printer/Modem Interface**     \$139.00

Apple Computer, Inc.

### **RATINGS**

A Overall rating  
B Price/performance  
A Software compatibility  
A Ease of installation  
B Documentation  
A Vendor support

### **FEATURES**

Serial/parallel:	S
Graphics dump:	-
Text dump:	-
ProDOS compatible:	+
CP/M compatible:	+
p-System compatible:	+
Printer specific:	No
Special fonts/typefaces	-
Nonvolatile memory:	-
Buffer size:	0

### **PRODUCT SUMMARY**

The Super Serial Card is the "standard" serial interface card for the Apple II, II+, and //e. It is designed both for serial printer and modem interfacing. It provides, under software control, simultaneous RS-232C output and screen echo and comes with a full 25-pin DB-25 socket, mounting bracket, and documentation. It is capable of carrying all the RS-232C signals.

The card will communicate at all standard baud rates from 50 to 19,200. It supports optional automatic line feed generation. As would be expected, it follows the Apple II firmware and I/O device protocol; so it should be compatible with most software written for Apple computers.

The card carries Apple's standard 90-day warranty.

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## **UniPrint Printer Interface**     \$89.00

Videx, Inc.

### **RATINGS**

B Overall rating  
A Price/performance  
B Software compatibility  
A Ease of installation  
B Documentation

### **FEATURES**

Serial/parallel:	P
Graphics dump:	H/D
Text dump:	-
ProDOS compatible:	+
CP/M compatible:	+

**RATINGS**

A Vendor support

**FEATURES**

p-System compatible:	+
Printer specific:	No
Special fonts/typefaces:	-
Nonvolatile memory:	-
Buffer size:	0

**PRODUCT SUMMARY**

UniPrint is a fairly standard, graphics, parallel printer interface. It will do a high-resolution or double high-resolution graphics dump either normal, rotated, expanded, or inverted. It will also dump color graphics to an IDS Prism printer.

The card features a dump parallel emulation mode. Supported text printing features include page width, length, left margin, and whether to echo output to another slot.

Some graphic applications require that an interface card be able to pass a full 8 bits of data. Many cards only transmit 7 bits, stripping off the high bit. Print-It transmits all 8 bits under software control.

Virtually all parallel printers are supported for text output. Graphics output is supported for the following printers: Apple Dot Matrix Printer, C-Itoh 8510, NEC 8023A, Epson, Gemini, IDS, Anadex, Mannesmann-Tally 160L, Centronics 739, and Gorilla Banana. Printer selection is made by DIP switches. Unlike many DIP switches found on printer interface cards, the switches on the UniPrint are particularly well labeled.

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**WORKSHEET FOR INTERFACE CARDS****PRODUCT**

\$ .

**MANUFACTURER****TYPE:****RATINGS**

Overall rating  
Price/performance  
Software compatibility  
Ease of installation  
Documentation  
Vendor support

**FEATURES**

Serial/parallel:  
Graphics dump:  
Text dump:  
ProDOS compatible:  
CP/M compatible:  
p-System compatible:  
Printer specific:  
Special fonts/typefaces:  
Nonvolatile memory:  
Buffer size:

## PRODUCT SUMMARY

Table 7-1. Comparative Ratings for Interface Cards.

DEVICE	PRICE	RATINGS					
		1	2	3	4	5	6
Alphabits	\$ 119.95	B	B	B	A	B	B
APIC	95.00	B	A	B	B	B	B
APIC w/color graphics	105.00	B	A	B	B	B	B
AP-830 Serial to Parallel	79.00	A	A	A	A	B	A
Dispatcher	139.00	B	B	B	A	B	A
Graphicard	99.00	A	B	A	A	A	A
Hamlet	98.50	A	A	A	B	A	B
Microbuffer II +	16K 259.00	B	B	B	A	B	A
	32K 299.00	B	B	B	A	B	A
	64K 349.00	B	B	B	A	B	A
Microbuffer II	16K 199.00	B	B	B	A	B	A
	32K 219.00	B	B	B	A	B	A
Nice Print	175.00	B	B	B	A	A	B
Parallel Interface Card IIe	165.00	B	B	A	A	A	B
Pkaso/U	175.00	A	A	A	A	A	B
Printerface	75.00	A	A	A	A	A	A
PrinterMate	99.00	B	B	B	A	B	A
Print-It	Model 1 199.00	B	B	A	B	B	B
	Model 2 149.00	B	B	A	A	B	B
PSIO	229.00	A	B	B	A	A	A
Serial to Parallel Adaptor	129.95	A	B	A	A	B	A
Seriall	159.00	B	B	A	A	A	A
Super Serial Card IIe	139.00	A	B	A	A	B	A
UniPrint	89.00	B	A	B	A	B	A
<b>KEY TO RATINGS</b> 1—Overall rating      4—Ease of installation 2—Price/performance      5—Documentation 3—Software compatibility      6—Vendor support							



Table 7-2. Comparative Features for Interface Cards.

DEVICE	FEATURES									
	1	2	3	4	5	6	7	8	9	10
Alphabits	S	H	40	+	-	+	No	-	-	0
APIC	P	H	40	+	+	+	Yes	-	-	0
Dispatcher	S	-	-	+	+	+	No	-	-	0
Graphicard	P	H	40/80	+	+	+	No	-	-	0
Microbuffer II +	S/P	H	-	+	+	+	No	-	-	16-64K
Microbuffer II	S/P	H	-	+	+	+	No	-	-	16-32K
Nice Print	P	H	40	+	+	+	P	+	-	0
Parallel Interface Card IIe	P	-	-	+	+	+	No	-	-	0
Pkaso/U	P	L/H	40/80	+	+	+	No	+	+	0
Printerface	P	H	40/80	+	+	+	No	-	+	0
PrinterMate	P	-	-	+	+	+	No	-	-	0
Print-It	S/P	L/H/D	40/80	+	+	+	No	-	-	0
PSIO	S/P	H	-	+	+	+	No	-	+	0
Seriall	S	H	-	+	+	+	No	-	-	0
Super Serial Card IIe	S	-	-	+	+	+	No	-	-	0
UniPrint	P	H/D	-	+	+	+	No	-	-	0
<b>KEY TO FEATURES</b> 1—Serial/Parallel 2—Graphics dump 3—Text dump 4—ProDOS compatible 5—CP/M compatible 6—p-System compatible 7—Printer specific 8—Special fonts/typefaces 9—Nonvolatile memory 10—Buffer size										

# Chapter 8



## Modems

A modem is a device which enables your computer to communicate with another computer many miles away using the public telephone lines. Modem is an acronym for *MO*dulator-*DE*Modulator, which also explains what it does. Because computers talk in digital codes and telephone lines listen in analog codes, the data from the computer must first be translated before it goes over the telephone lines. The modem modulates the digital signal into the analog signal and demodulates the analog signal into the digital signal.

A modem requires communications software so you can send data from the keyboard and display incoming data on the screen. Some of this software is provided with the Apple II, and includes commands for setting protocols not included in the RS-232C standard. The computer that is sending and the computer that is receiving must agree on a number of items—speed of transmission, parity, duplex, Bell prototype, etc.—and this is accomplished with software. You may purchase additional software to provide you with convenient features for the modem, depending on your individual needs.

The main questions for a modem buyer are:

- ☐ How fast can it transmit data?
- ☐ How does the modem connect to the computer?
- ☐ Can the data be transmitted one way or two ways?

### TRANSMISSION SPEED

The two most popular speeds for home computer users are 300 bits per second

(or baud) and 1200 bits per second. Speed is important for two reasons. First, the companies with which you communicate charge by the hour and by the baud. For example, CompuServe charges \$5 an hour for 300 baud, or \$17.50 an hour for 1200 baud in off hours. It takes about one minute to transfer 2000 bytes of text at 300 baud. Anything under 600 baud is considered low speed, and it is more than sufficient for the Apple II user.

Speed is also important when large amounts of information are to be transferred. Since you are using phone lines, you must consider the telephone bill.

## CONNECTING THE MODEM

There are two ways to connect the modem. Either the telephone receiver is placed in a cradling device called an *acoustic coupler*, or a jack is plugged into the modem and the phone, called a *direct connection*. The direct connection offers the best transmission, is less expensive, and more than meets the needs of the Apple II user. The telephone company will check to see that it meets with regulations.

## ONE-WAY OR TWO-WAY TRANSMISSION

Two-way transmission indicates that data can be transmitted and received at the same time and in both directions. One-way is referred to as *half-duplex* and works like a CB radio transmission: only one person can talk at a time. Two-way, or *full-duplex*, works like a telephone where two people can talk simultaneously back and forth.

All of this discussion relates to the modem's compatibility with the telephone lines. Modems are either compatible with Bell 103/113, Bell 202, or Bell 212A, and in some cases with two of them. There are one or two others; however, the Apple II user will be interested in the ones we have mentioned. Some information utilities with which you want to receive information will only use one of these. The Bell 212A is the fastest and most expensive of the three.

## FEATURES

A manufacturer might indicate that its modem is full-featured, even though it does not contain all the possible modem features. Here is a list and brief description of the modem features:

*Auto answer* indicates the modem will answer its own calls automatically. You do not have to be there.

*Built-in self test* is circuitry that checks for errors and the modem's capability to send and receive data. The test modes include analog loop-back, digital loop-back, and remote digital loop.

*Busy mode* is for those times when you want to use your system for something else and not receive calls. It is like taking the phone off the hook.

*Command abort* is a signal that interrupts the transmission before the call is completed. Some modems will use the carriage return (or two) for this purpose.

*Command mode* allows you to use software to direct the modem's operation.

*Command recognition* is the ability of the modem to accept commands at different speeds or parities. Some modems require specific speeds for commands, while others do not.

*Dialing directory* lets you store frequently used telephone numbers and 20 to 60 explanation characters. If the directory is stored in memory, a battery will be needed to retain the numbers if the phone is disconnected.

*Dial tones*, pulse or touch, are what the telephone company responds to and may also include a second tone for additional numbers. The tone put out by the modem must correspond to the tone used by your telephone.

*Directory modification* is the ability to change the phone numbers listed in the directory.

*Help command* gives you access to the help files by typing either an **H** or **HELP**.

*Last number redial* automatically redials the last number dialed.

*Manual dial* permits you to dial a number by typing it in from the keyboard.

*Modem register contents* are used to check or modify the contents of the modem's internal memory register.

*Modem switches* are required by some software for the program to function properly. They are set either through software or manual switch control.

*Name selection dialing* is used for typing in a name on the keyboard which corresponds to a directory number to be dialed.

*Number linking* indicates a second number to be dialed if the first number is busy.

*Originate/Answer* allows you to send and receive data.

*Originate Only* indicates that data may only be sent and not received.

*Protocol detect and switch* determines the protocol of the incoming call and switches its protocol to match it.

*Quit command* allows the user to turn off the internal monitor programs.

*Repeat dialing* allows for repeated dialing of a phone number a specific number of times.

*Set answerback string* is used to eliminate typing in the responding code words (answerback string) each time.

*Set attention character* allows the user to get the modem's attention to give it further commands while it is transmitting or receiving data.

*Set backspace character* allows the user to select any character and designate it as a backspace key.

*Set disconnect character* enables the user to designate one to two characters which will cause the modem to break the connection.

## INFORMATION SERVICES

There are a number of services available to the Apple II user. They include among others, stock market prices, encyclopedia references, current news and weather, and movie and book reviews. There is a charge for these services, as well as a registration fee which varies. The most popular information services are described here.

The Source, 1616 Anderson Rd., McLean, VA 22102 provides daily news, excerpts from financial publications, financial reports on over 3000 companies, bond

and commodity prices, and movie and restaurant reviews. It also provides an electronic catalog for purchasing items, electronic mail, and games. The registration fee is \$100, and connection costs run from \$7.75 to \$20.75 per hour.

Dow Jones News/Retrieval, Box 300, Princeton, NJ 08540 provides stock prices for all companies on the major exchanges, either current or for prior years. It also provides financial disclosures and news affecting particular companies. You have access to articles from *The Wall Street Journal* and *Barrons*, as well as a 20-volume encyclopedia. Some modems provide a free subscription to this service, and the connection cost ranges from \$.15 to \$1.20 per minute.

Dialog's Knowledge Index, 3460 Hillview Avenue, Palo Alto, CA 94304 provides technical information and includes summaries and complete copies of over 7 million articles, reports, and books. Over 25,000 publications by the United States Government Printing Office are available through them. The registration fee is \$35.00, and the connection cost is \$24 per hour.

CompuServe Information Service, 5000 Arlington Center Blvd., Columbus, OH 43320 provides investor-oriented information, including stock quotes and historical data for over 40,000 companies, as well as data from Standard & Poors and Value Line. There is also a service which provides you with technical assistance for operating your computer. Registration is \$40.00 and may be free with some modems.

Other information is available locally through bulletin boards, which include consumer products, local meetings, dating services, and ride sharing. Another source is electronic mail, which permits you to send a message that is held for someone away from their office or home. There is a postal service where you type in a letter and send it, and it is printed and delivered on the receiving end. In some cases they guarantee 4-hour delivery.

You may use your modem for your banking and bill-paying needs. Funds can be transferred between accounts, bills can be paid, and you can receive current statements.

School work can be sent and received with a modem, or you can carry on a remote chess game and never leave your home.

---

## Apple CAT II

\$389.00

Novation, Inc.

### RATINGS

B Overall rating  
B Price/performance  
B Ease of installation  
B Documentation  
B Vendor support

### FEATURES

Connection:	Direct
Bell prototype:	Bell 103
Operations:	Auto dial/answer
Voice:	+
Baud rate:	300
Duplex:	Half
Dialing:	Tone/pulse

## PRODUCT SUMMARY

The Novation Apple Cat II is a very versatile modem with a myriad of extra features. It communicates, using the Bell 103 protocol, at a variety of baud rates, including the standard 110 and 300 and 45.5, 50, 75, and 150. It also communicates at the 1200 baud rate with the rarely used Bell 202 protocol. This 1200 baud rate is a half-duplex mode, useful mainly for transferring data at high speed between two Apple Cat modems.

Installation of the Apple Cat is quite simple. Simply place it in any slot (slot 2 is recommended and standard) and attach the phone line to the modular jack which is attached to the modem. If you purchase the optional 212A upgrade board (\$389.00), which permits full-duplex communication at 1200 baud using the standard Bell 212A protocol, you have two options:

- ☐ The card can be installed in another, adjacent slot.
- ☐ The card can be used with the "slot saver," which is attached to the original card but does not take up a second slot on the motherboard.

The modem comes with two sets of wires with jacks on the end. One set is for the standard phone line. The other will hold the optional handset, which permits voice communication when using the Apple Cat, as well as listening for busy signals when dialing remote computers.

Novation offers a variety of options for use with the Apple Cat, including:

- ☐ An expansion module which provides jacks for the phone line and handset, a serial printer port (RS-232C compatible), a BSR transformer connection, cassette recorder microphone and remote control connectors, and an off-hook LED indicator. (\$39.00)
  - ☐ Handset
  - ☐ Firmware ROM which plugs into the main board of the modem and provides machine-language routines to use the modem from your own BASIC and Pascal programs with commands which mimic those used by the Hayes Micromodem. (\$29.00)
  - ☐ Touch-tone decoder, a chip which plugs into the main board of the modem, permitting the modem to decode touch-tone signals sent over the phone line. (\$99.00)

The modem comes with COM WARE software on disk, which includes a variety of features: data capture, sending and receiving files, terminal characteristics configuration, 26-phone number memory with automatic configuration, and 40- and 80-column display. It is nearly the only communications program you will need as long as you communicate from DOS 3.3.

## Apple Modem

300 baud—\$225.00

Apple Computer Inc.

1200 baud—\$495.00

### RATINGS

A Overall rating  
B Price/performance  
A Ease of installation  
A Documentation  
B Vendor support

### FEATURES

Connection:	Direct
Bell prototype:	103/212A
Operations:	Auto dial/answer
Voice:	+
Baud rate:	300/1200
Duplex:	Full/half
Dialing:	Tone/pulse

### PRODUCT SUMMARY

The Apple Modem (Fig. 8-1) comes in two forms—as a 300-baud, Bell 103 modem and as a 1200-baud, Bell 212A modem. The 1200-baud modem also functions in the 300-baud form.

The modem is relatively small and quite thin. It will fit comfortably under a standard desktop telephone. The modem has a built-in speaker with an adjustable volume control so you can listen to the dialing and connection and determine if the reason for no carrier is a busy signal, dead line, or no answer. The speaker also lets you hear messages about new numbers, if the number has changed. Once the carrier has been detected, the speaker shuts off so you do not have to listen to the high-pitched modem tones. The volume control on the modem can be adjusted with an Allen wrench.



Fig. 8-1. The Apple Modem comes in a 300- and 1200-baud version (courtesy of Apple Computer, Inc.).

The cable connector on the back of the modem is not a standard DB-25 connector that you expect with an RS-232C interface. Instead it is a DB-9. All the necessary wires are present but you do need a special cable. Apple provides two special cables as part of the accessory kits with the modems. One is designed for use with the Apple *IIfx* equipped with an Apple Super Serial Card. The other is designed for use with the Apple *IIfx* by connection with the modem port. Each kit contains a special cable, a manual discussing setup of the modem on the particular machine involved, and a simple terminal software program.

The Apple Modem is similar to the Password Modem. Indeed, both modems are built by U.S. Robotics. The main difference between the two is in the form of the connector on the back of the modem.

---

## Hayes Micromodem II/*IIfx*

\$379.00

Hayes Microcomputer Products, Inc.

### RATINGS

B Overall rating  
B Price/performance  
B Ease of installation  
B Documentation  
A Vendor support

### FEATURES

Connection:	Direct
Bell prototype:	103
Operations:	Auto dial/answer
Voice:	+
Baud rate:	300
Duplex:	Full/half
Dialing:	Tone/pulse

### PRODUCT SUMMARY

The Hayes Micromodem II was the first standard modem on a card for the Apple computers. It has a built-in firmware terminal program which provides for commands to be issued from BASIC to Pascal. Many programs use the commands to access the features of the Micromodem.

The Micromodem has an optional terminal program software called Smartcom I (\$99.00) which features auto redial, storage of three phone numbers, and access of files from DOS, Pascal, CP/M, and CP/M Plus.

Pulse dialing is available on both Micromodems. The Micromodem *IIfx* also supports touch-tone dialing.

The *IIfx* version of the Micromodem has a built-in speaker which monitors calls when the modem is dialing. This speaker permits you to determine if the number you are calling is busy.



## Hayes Smartmodem 300

\$289.00

Hayes Microcomputer Products, Inc.

### RATINGS

A Overall Rating  
A Price/performance  
A Ease of installation  
A Documentation  
B Vendor support

### FEATURES

Connection:	Direct
Bell prototype:	103
Operations:	Auto dial/answer
Voice:	—
Baud rate:	300
Duplex:	Full/half
Dialing:	Tone/pulse

### PRODUCT SUMMARY

The Hayes Smartmodem 300 (Fig. 8-2) is one of the most popular modems available for personal computers. It has become a standard against which other modems are compared. Most recent terminal programs support Hayes or are designed for it.

The Hayes is "Smart" because it has some software built into it. You can send commands to it directly through the keyboard or from a software program.

The Hayes Smartmodem 300 is an external modem that works with any RS-232C port.

The only drawback with the Smartmodem is the price for a 300-baud modem.



Fig. 8-2. The Smartmodem is just one of many telecommunication products available for the Apple and other personal computers (courtesy of Hayes Microcomputer Products).

If you want a low-cost telecommunications system, you may not want to pay for the extra price. If however, you want a rugged modem that will be compatible with most software, then this is the modem to get.

There is a 1-year warranty with the Hayes Smartmodem 300.

---

## Hayes Smartmodem 1200

\$699.00

Hayes Microcomputer Products, Inc.

### RATINGS

- A Overall rating
- A Price/performance
- A Ease of installation
- B Documentation
- B Vendor support

### FEATURES

Connection:	Direct
Bell prototype:	212A
Operations:	Auto/manual
Voice:	dial;
Baud rate:	Auto/manual
Duplex:	answer
Dialing:	-
	1200
	Full/half
	Tone/pulse

### PRODUCT SUMMARY

This is the most popular modem around. The 1200 contains some communications software to allow you to send commands to the modem directly from the keyboard, a real timesaver.

Because the Hayes protocol has become a standard, most terminal and communications programs support and are designed to run on the Smartmodem.

The Hayes Smartmodem 1200 is an external modem and will hook up to the RS-232C port. You must supply your own cable.

The Smartmodem is not the cheapest modem on the market, but it is certainly one of the best. If you have a lot of data to transfer over long distances or just spend a lot of time on a modem, then this would be a smart purchase.

As far as the actual function of the modem, Hayes has a good reputation. Their products rarely fail. That is very important when the data you are transmitting is critical. If it is text, then a small error here or there can easily be fixed. If, however, you are transmitting binary files, one missed or skewed bit could render the whole transmission useless. A high-integrity modem can be very important.

The Hayes Smartmodem 1200 comes with a 1-year warranty.

## Networker

\$129.00

ZOOM Telephonics Inc.

### RATINGS

B Overall rating  
A Price/performance  
A Ease of installation  
B Documentation  
B Vendor support

### FEATURES

Connection:	Direct
Bell prototype:	Bell 103
Operations:	Auto dial
Voice:	-
Baud rate:	300
Duplex:	Full/half
Dialing:	Tone/pulse

### PRODUCT SUMMARY

The Networker is the lowest-cost, full-featured modem available for the Apple. It simply plugs into any slot (recommended for slot 2). The phone line then connects directly to the modem.

The modem will communicate at 110 and 300 baud using the Bell 103 protocol. It permits the standard range of configuration including 7 or 8 data bits, 1 or 2 stop bits, odd or even parity, and full or half duplex. It can be manually switched between answer and original modes. An LED on the card glows when a carrier is detected.

There is basic communications software in ROM, and a terminal package is available. The optional software provides data capture.

---

## Password

300 baud—\$199.00

U.S. Robotics, Inc.

1200 baud—\$449.00

### RATINGS

A Overall rating  
A Price/performance  
A Ease of installation  
B Documentation  
B Vendor support

### FEATURES

Connection:	Direct
Bell prototype:	103/212A
Operations:	Auto
Voice:	dial/answer
Baud rate:	+
Duplex:	300/1200
Dialing:	Full/half
	Tone/pulse

### PRODUCT SUMMARY

The Password comes in two forms—the Password 300, a 300-baud, Bell 103 modem, and the Password 1200, a 1200-baud, Bell 212A modem. The 1200-baud modem also functions as a 300-baud modem.

The modem fits comfortably under a standard desktop telephone. It has a built-in speaker with an adjustable volume control so you can listen to the dialing and connection and determine if the reason for no carrier is a busy signal, dead line, or no answer. The speaker also lets you hear messages about new numbers, if the number has changed. Once the carrier has been detected, the speaker shuts off so you do not have to listen to the high-pitched modem tones. The volume control on the modem can be adjusted with an Allen wrench.

To install the modem you merely connect it with a standard RS-232C cable with a DB-25 connector.

The Password is similar to the Apple Modem, also built by U.S. Robotics. The main difference is that the Password has a standard DB-25 connector on its back.

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## **ProModem 1200A**

**\$449.00**

Prometheus Products, Inc.

### **RATINGS**

B Overall rating  
B Price/performance  
B Ease of installation  
B Documentation  
A Vendor support

### **FEATURES**

Connection:	Direct
Bell prototype:	Bell
Operations:	103/212A
Voice	Auto
Baud rate:	dial/answer
Duplex:	+
Dialing:	300/1200
	Full/half
	Tone/pulse

### **PRODUCT SUMMARY**

The ProModem is one of the few single-card, plug-in, 1200-baud modems available for the Apple II family. It is based on the stand-alone Prometheus modem and the ProModem 1200B available for the IBM PC. It plugs into slot 2 (recommended) on the Apple II, II+, and IIe and communicates at 300 and 1200 baud using the Bell 212A and 103 protocols.

There is a firmware program in ROM which provides terminal functions for the modem. The modem features auto answer, auto dial, and auto redial if a busy signal is received. There is a built-in speaker with volume control to permit you to monitor the status of the phone line. There is also a jack available for a phone handset.

The command set for the modem is compatible with those used for the Hayes Micromodem. The modem also comes with built-in diagnostics.

## Volksmodem

\$79.95

Anchor Automation, Inc.

### RATINGS

B Overall rating  
B Price/performance  
B Ease of installation  
C Documentation  
B Vendor support

### FEATURES

Connection:	Direct
Bell prototype:	Bell 103
	Auto
Operations:	dial/answer
	+
	300
Voice:	Full/half
Baud Rate:	Pulse
Duplex:	
Dialing:	

### PRODUCT SUMMARY

The Volksmodem 300-baud external modem (Fig. 8-3) provides a toggle switch for either phone mode (conversation) or data mode (transmission of data). A tone sounds if the battery is working. With the switch set to phone mode, there is no drain on the battery, and you can use your telephone for normal conversations. There is another switch for either full or half duplex. There is a second port for connecting the modem to the base of the telephone. Communications software must be purchased for this modem. The answer or originate mode is selected automatically.

The cable to connect the phone to the modem is included; however, an additional cable (\$20.00) is needed for the interface to connect the modem to the computer using the user port. The Volksmodem also requires a 9-volt battery for the internal power.



Fig. 8-3. The Volksmodem is a good, low-cost modem for the Apple (courtesy of Anchor Automation).

The documentation for other than the basics is sketchy, although installation can be done quickly. You will need to purchase communications software to set other parameters.

There is a lifetime warranty on this modem for normal use. Technical support is available from local distributors or the manufacturer.

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## **X100 POPCOM**

**\$475.00**

**PRENTICE Corporation**

### **RATINGS**

B Overall rating  
B Price/performance  
B Ease of installation  
A Documentation  
A Vendor support

### **FEATURES**

Connection:	Direct
Bell prototype:	103/212A
Operations:	
	Auto
Voice:	dial/answer
Baud rate:	+
Duplex:	300/1200
Dialing:	Full/half
	Tone/pulse

### **PRODUCT SUMMARY**

The X100 POPCOM is a very small, external modem. It can transmit data at 300 or 1200 baud. The model is so small that it actually just plugs into the wall and looks like an oversized plug. The size makes it handy and out of the way at the same time. It also eliminates the need for one more cord at your work station.

All that is needed is an RS-232C cable from the computer. The POPCOM accepts Hayes command protocol; so any program designed to work with the Hayes Smartmodem 1200 or 300 will work with this modem. It also has its own set of commands, which are available to the user in much the same manner as the Hayes commands and can be sent via command strings.

The POPCOM comes with a 2-year warranty from the manufacturer.

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## **WORKSHEET FOR MODEMS**

### **PRODUCT**

### **MANUFACTURER**

### **RATINGS**

Overall rating  
Price/performance  
Ease of installation

### **FEATURES**

Connection:  
Bell prototype:  
Operations:

## RATINGS

Documentation  
Vendor support

## FEATURES

Voice:  
Baud rate:  
Duplex:  
Dialing:

## PRODUCT SUMMARY

Table 8-1. Comparative Ratings for Modems.

DEVICE	PRICE	RATINGS				
		1	2	3	4	5
Apple Cat II	\$ 389.00	B	B	B	B	A
Apple Modem	300 baud 225.00	A	B	A	A	B
	1200 baud 495.00	A	B	A	A	B
Hayes Micromodem II//e	379.00	B	B	B	B	A
Hayes Smartmodem 300	289.00	A	A	A	A	B
Hayes Smartmodem 1200	699.00	A	A	A	B	B
Networker	129.00	B	A	A	B	B
Password	300 baud 199.00	A	A	A	B	B
	1200 baud 449.00	A	A	A	B	B
Promodem 1200A	449.00	B	B	B	B	A
Volksmodem	79.95	B	B	B	C	B
X100 POPCOM	475.00	B	B	B	A	A

**KEY TO RATINGS**  
1—Overall rating  
2—Price/performance  
3—Ease of installation  
4—Documentation  
5—Vendor support

Table 8-2. Comparative Features for Modems.

DEVICE	FEATURES						
	1	2	3	4	5	6	7
Apple Cat II	D	103	Auto D/A	+	300	H	T/P
Apple Modem	D	103/212A	Auto D/A	+	300/1200	F/H	T/P
Hayes Micromodem II//e	D	103	Auto D/A	+	300	F/H	T/P
Hayes Smartmodem 300	D	103	Auto D/A	-	300	F/H	T/P
Hayes Smartmodem 1200	D	212A	Auto D/A Man D/A	-	1200	F/H	T/P
Networker	D	103	Auto D	-	300	F/H	T/P
Password	D	103/212A	Auto D/A	+	300/1200	F/H	T/P
Promodem 1200A	D	103/212A	Auto D/A	+	300/1200	F/H	T/P
VOLKSMODEM	D	103	Auto D/A	+	300/1200	F/H	T/P
X100 POPCOM	D	103/212A	Auto D/A	+	300	F/H	T

**KEY TO FEATURES**  
1—Connection (D = Direct)  
2—Bell prototype  
3—Operations (D = Dial, A = Answer)  
4—Voice  
5—Baud rate  
6—Duplex (F = Full, H = Half)  
7—Dialing (T = Tone, P = Pulse)

# Chapter 9



## Monitors

A *monitor* is a viewing screen. It is either built in to the computer, as in the Macintosh, or connected to a peripheral card, as in an RGB monitor with the II, II+, or IIe, or a built-in connector of the II, II+, IIe, or IIC. The monitor serves the basic function of displaying information entered from the keyboard and allowing the Apple and its software to display messages to the user. Monitors are either color or monochrome (single color).

### GENERAL INFORMATION

The monitor is very similar to a television. Its main component is a cathode ray tube (CRT) which acts like the old TV picture tubes. The CRT puts out an electron beam (or three beams for a color monitor) which repeatedly scans the screen from top to bottom in a zig-zag fashion, switching on and off. The back of the monochrome screen is coated with phosphorus, which lights up when beam shines on it. An image is displayed by switching the beam on and off at the right places.

On the color monitor are three sets of three kinds of phosphorous dots. A perforated mask, the *shadow mask*, filters the colored beams so each reaches its own set of dots. The space between these perforations is called the *dot pitch*. The smaller the distance, the better the resolution.

The individual units which make up each scan line are called *pixels*. The more pixels a given monitor generates, the better the image which is created.

The image is affected by the amount of time the pixels remain on the screen, referred to as the *phosphor persistence*. A short persistence will create a flickering



of the characters, while a long persistence will create a ghost image.

The pixels are turned on or lit up by the program you are running. In the standard mode, the alphanumeric characters are displayed. The character generator in the memory contains instructions for displaying these characters, and no further programming is needed. You could change the bits in the character generator, or create your own by doing your own programming. In the high-resolution mode you can individually program each of these pixels.

The monitor can only accept this information at a certain rate, called the *bandwidth*. It is measured in megahertz (MHz). The greater the bandwidth, the sharper the characters.

The size of the screen is very important for two reasons. First, a small screen, 5 to 9 inches, can be very hard on the eyes for prolonged periods. Secondly, a small screen compacts the material. An 80-column display gets pretty crowded on a 5-inch screen. If, however, you must carry your computer around, a 5-inch screen may be more advantageous than a 19-inch screen. The size of the screen you choose will depend on the amount of use and the degree of portability you desire.

## **MONOCHROME MONITORS**

Monochrome monitors are often used for word processing, business programs, and other essentially text-oriented applications. There are three main variations of monochrome monitors: amber on black, green on black, and white on black. Of these three, the amber and the green are easiest on the eyes, and some people feel the amber is easier on the eyes than the green.

## **COLOR MONITORS**

Color monitors are used primarily for graphics. There are three beams: red, blue, and green. By varying the intensity of the three beams, you can create all the colors of the spectrum on the monitor's screen.

There are two types of color monitors, RGB (red, green, blue) and composite video. An RGB unit needs three lines for each of the colors, while the composite video monitor sends the color information through one line.

## **USING A TV**

Your television set will work just fine with the Apple. The major disadvantage is the distortion created because of the nature of the TV. The circuitry in the TV is geared to receive a signal carried over radio waves from a transmitter. Computer information must be modulated to resemble this signal. Channel 3 is usually used for this purpose. You might also experience interference when your television picks up the real Channel 3 signals. Combined, these difficulties are enough to limit a TV to 40 columns of characters. Still, a good color TV will do a good job on games and simple graphics.

If you plan to spend a lot of time using your computer, consider that the characters on the television screen may be a little blurred, which will strain and tire your eyes rapidly.

If cost is a factor, the main advantage to using the TV set is the fact that you already have the set in your home, and a monitor must be purchased separately from the computer. While few Apple owners will use a TV instead of a monitor, many may wish to use their color TV occasionally to see the excellent color graphics of the PC without investing in a color monitor.

## MONITOR INTERFACES

Both the Apple *IIfx* and *IIfx* have a built-in interface for monochrome and composite color monitors. Using a black-and-white or color TV requires a small device called a *radio frequency modulator*. A modulator comes with the Apple *IIfx*. Several can be purchased for the II, II+, and *IIfx*. The Apple *IIfx* also has a built-in RGB connector, but it uses a nonstandard interface. Apple will offer an RGB monitor that can plug directly into the *IIfx*. Standard RGB monitors will require an RGB adaptor, such as the Video 7 adaptor, to run with the Apple *IIfx*. Any RGB color monitor will need an RGB interface card to work with the II, II+, or *IIfx*.

## BUYING TIPS AND TRICKS

After you decide whether you need a color or monochrome monitor, start shopping around for the best quality of image produced. Try and compare the images on two screens side by side, if possible. Next, fill the screen up with an image and step back and check the following:

- ☐ Are the characters all lined up evenly?
- ☐ Are the vertical columns and the horizontal rows even?
- ☐ Are the characters at the edges of the screen clear?
- ☐ Do the color characters have fringe around their edges?
- ☐ Is the intensity of the characters equal?
- ☐ Are the characters in the middle of the screen brighter than those on the edges?
- ☐ Are there buttons or knobs on the monitor to adjust the contrast, vertical/horizontal lines and brightness; and to what extent can they be adjusted? (Move the knobs to see.)
- ☐ If you hold a key down so the cursor moves across the screen, is there a trail after the letter?

If you are looking at monochrome monitors, check all three varieties. When looking at a specifications sheet for a monitor, check these items:

- ☐ How many pixels are there? What is the screen resolution? More pixels mean sharper images.
- ☐ What is the dot pitch? The smaller the distance, the better the resolution.
- ☐ What is the bandwidth? The greater the bandwidth, the sharper the image.
- ☐ What is the phosphor persistence? Do you get flickering characters (too short) or ghost characters (too long)?
- ☐ What is the size of the screen? Unless portability is your aim, a 5- to 9-inch screen is pretty small and hard on the eyes.

## Amdek Color 400

\$399.00

Amdek Corporation

### RATINGS

A Overall rating  
A Price/performance  
B Ease of installation  
B Documentation  
A Vendor support

### FEATURES

Type:	RGB
Size:	13"
Pixel	
resolution:	380 × 240
Text	
resolution:	
Sound	40 × 25
channel:	
	+

re

### PRODUCT SUMMARY

The Color 400 is a low-cost, 13-inch, color monitor. It is best suited for home or nonprofessional uses, such as games and casual programming. Because it is limited to only 40 columns of text, it is really not very useful for word processing.

### INTERFACING

The Amdek Color 400 requires an RGB interface card.

### PERFORMANCE

For personal or educational use, this is a wonderful monitor. It has enough resolution to have a readable 40-column text mode, and enough color definition to provide graphics suitable for most games.

### VENDOR SUPPORT

Amdek supports all of its monitors with a 2-year warranty on the electronics and a 3-year warranty on the CRT.

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## Amdek Color 500

\$525.00

Amdek Corporation

### RATINGS

A Overall rating  
A Price/performance  
B Ease of installation

### FEATURES

Type:	RGB/ Composite
Size:	13"
Pixel	
resolution:	460 × 240/ 320 × 240

## RATINGS

B Documentation  
A Vendor support

## FEATURES

Text  
resolution: 80 × 25/  
64 × 25  
Sound  
channel:  
+

## PRODUCT SUMMARY

This is a high-quality, versatile, color monitor. It can switch between RGB and composite. It even has a mode to work with your VCR, providing a video picture must better than most TVs can produce.

## INTERFACING

This monitor can work with an RGB or RCA (composite) interface.

## PERFORMANCE

This is a very versatile monitor. If you are interested in a monitor that will work with your current composite video output and will be upwardly compatible with an RGB, then this is a good buy.

## VENDOR SUPPORT

Amdek is very customer conscious. It backs up its products with a 2-year warranty on monitor parts and a 3-year warranty on the CRT.

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## Amdek Color 600

\$650.00

Amdek Corporation

## RATINGS

B Overall rating  
B Price/performance  
B Ease of installation  
A Documentation  
A Vendor support

## FEATURES

Type: RGB  
Size: 13"  
Pixel  
resolution: 640 × 240  
Text  
resolution:  
Sound 80 × 25  
channel:  
+

## PRODUCT SUMMARY

The Amdek Color 600 (Fig. 9-1) is a high-quality, general-purpose, color display.



Fig. 9-1. The Amdek Color 600 is a good, general-purpose color monitor (courtesy of Amdek Corporation).

Because of the graphics and sound capabilities of this monitor, it is a good choice for graphics and game playing.

If you are looking for a monitor that will look good in your office, then this is a good choice. This monitor is very professional looking.

### **INTERFACING**

The 600 requires an RGB interface and cable.

### **PERFORMANCE**

The color graphics on this monitor are adequate. Unless you purchase an

ultrahigh-resolution graphics card for your computer, this monitor will operate well.

The Color 600 offers a text mode (green screen) which is available via a switch on the front panel. The 80-column mode is readable, but may not be comfortable for long periods. If you plan on doing a lot of word processing, it may be smart to invest in a different monitor.

## **VENDOR SUPPORT**

Amdek gets an A rating on its vendor support because of its reputation for building quality peripherals. To back up its claim, it has a 2-year limited warranty on the monitor components, and a 3-year warranty on the CRT.

---

## **Amdek Color 710**

\$799.00

Amdek Corporation

### **RATINGS**

B Overall rating  
B Price/performance  
B Ease of installation  
A Documentation  
A Vendor support

### **FEATURES**

Type:	RGB
Size:	13"
Pixel	
resolution:	710 × 480
Text	
resolution:	
Sound	80 × 25
channel:	—

## **PRODUCT SUMMARY**

The Amdek Color 710 is an ultrahigh-resolution color monitor. It is designed to display high-resolution graphics on a personal computer. Its features include a green screen mode for easy data processing and a swivel base for maximum viewing comfort.

## **INTERFACING**

The 710 has a convenient switch on the back of the unit to allow the user to select between the Apple and an IBM PC, using an RGB interface card.

## **PERFORMANCE**

The Amdek 710 is a very rugged performer. The graphics are sharp, and the green screen mode is very functional. Also because of the reputation of Amdek, this monitor is recommended for long-term industrial use.

## **VENDOR SUPPORT**

The Color 710 is protected with Amdek's exclusive 2-year warranty on monitor electronics, and 3-year warranty on the CRT.

## AU 9191 U

\$349.00

BMC USA, Inc.

### RATINGS

B Overall rating  
B Price/performance  
A Ease of installation  
B Documentation  
B Vendor support

### FEATURES

Type:	Composite
Size:	13"
Pixel	
resolution:	350 × 350
	80 × 25
Text	(5 × 7 dots)
resolution:	
	+
Sound	
channel:	

### PRODUCT SUMMARY

The AU 9191 U color monitor features high-level performance on a large screen. Controls for power indicator, power on, volume, color, tint, contrast, brightness, horizontal center, and vertical hold are all conveniently located on the front panel.

### INTERFACING

There is an RCA jack in the back for video and audio input.

### PERFORMANCE

This model provides clear, crisp characters. Although the number of pixels indicate a high resolution, the display did not show this to be true. With a low phosphor persistence, characters flickered on the screen.

### VENDOR SUPPORT

There is a 90-day over-the-counter exchange for this monitor. Technical support is available through local distributors or from the manufacturer.

---

## Color I

\$329.00

Amdek Corporation

### RATINGS

A Overall rating  
A Price/performance  
A Ease of installation  
B Documentation

### FEATURES

Type:	Composite
Size:	13"
Pixel	
resolution:	300 × 260

## **RATINGS**

A Vendor support

## **FEATURES**

Text

resolution: 32 × 24

Sound

channel: +

## **PRODUCT SUMMARY**

This color monitor features a large screen and controls on the front panel for adjusting brightness, tint, color, contrast, and power on/off, which is also used for the volume. The vertical/horizontal hold, vertical size, etc. are in the back of the monitor. There are seven colors—red, green, blue, yellow, cyan, magenta, and white—from which you can create an infinite number of shades.

## **INTERFACING**

The RCA phono-jack is used for the video input.

## **PERFORMANCE**

This monitor recommends a maximum of 768 characters on the screen in an 8- × 8 matrix, which limits the quality of the resolution, especially for any word processing applications. The phosphor persistence is low, creating flickering characters.

## **VENDOR SUPPORT**

There is a 2-year warranty on monitor electronics and a 3-year warranty on the CRT. Technical support is available from local distributors or the manufacturer.

---

**CR-5400**

\$100.00

Comrex International

## **RATINGS**

B Overall rating

A Price/performance

A Ease of installation

A Documentation

C Vendor support

## **FEATURES**

Type:

Composite

Size:

9"

Pixel

resolution:

650 lines

Text

resolution:

80 × 25

Sound

channel:

-

## **PRODUCT SUMMARY**

This is a 9-inch, monochrome, composite video monitor, with a bandwidth of 20 MHz. It has 800 lines at the center and 650 lines at the corner. The CR-5400



is available in green, yellow-green, or amber. Controls for brightness and contrast are on the front panel, while the controls for vertical/horizontal, vertical size, and data in and out connectors are in the back. Should you want to link multiple monitors to the same computer, there is a 75-ohm impedance switch can be set to High.

## INTERFACING

An RCA video cable is used to interface this monitor.

## PERFORMANCE

The CR-5400 performs very well. The resolution is good, giving you a clear, crisp display. With a moderate phosphor persistence, there is no flickering in the display. The characters around the border were a little distorted, and we were told that this was because the monitor was in constant use.

## VENDOR SUPPORT

There is a 90-day warranty on parts and labor. Technical support is available from local distributors or the manufacturer.

---

## CR-5600

\$150.00

Comrex International

### RATINGS

B Overall rating  
B Price/performance  
A Ease of installation  
A Documentation  
C Vendor support

### FEATURES

Type:	Composite
Size:	12"
Pixel	
resolution:	800 pixels
Text	80 × 25
resolution:	
Sound	—
channel:	

## PRODUCT SUMMARY

The CR-5600 is a 12-inch monitor with green, yellow/green, or amber displays. The bandwidth is 20 MHz. Brightness and contrast knobs are in the front, while the vertical/horizontal hold, vertical size, and data in and out connectors are in the back. To link more than one monitor to the same computer, you set the 75-ohm impedance switch to High.

## INTERFACING

The RCA jacks in the back are used for video input.

## PERFORMANCE

This model provides clear, crisp characters and good resolution. There is a slight flicker of the characters because the phosphor persistence level is low. Characters around the edges were a little distorted; however it may have been due to overuse of the monitor we reviewed.

## VENDOR SUPPORT

There is a 90-day warranty on parts and labor. Technical support is available through local distributors, or the manufacturer.

---

## CR-6500

\$350.00

Comrex International

### RATINGS

B Overall rating  
B Price/performance  
A Ease of installation  
A Documentation  
C Vendor support

### FEATURES

Type:	Composite
Size:	13"
Pixel	
resolution:	300 × 260
Text	
resolution:	40 × 24
Sound	
channel:	+

## PRODUCT SUMMARY

The CR-6500 color monitor provides a large screen and a black matrix picture tube for higher contrast; it is thus easier on the eyes. There is a built-in, 2-watt amplifier with a weak internal speaker. A flip-down front panel provides contrast, brightness, tint, color, and vertical hold knobs. The on/off knob is located on the lower right front for easy access, and a power indicator prevents you from accidentally leaving the monitor on. It is a very heavy monitor (25+ lbs) and will need its own stand. Do not place it on top of a computer.

## INTERFACING

The RCA phono-jack is used for video input.

## PERFORMANCE

Like the Color I, the maximum recommended characters displayed by the CR-6500 are 768 on the 8-×-8 matrix. This feature creates poor resolution, especially for word processing applications. There is a considerable amount of flicker, due to low phosphor persistence.

## **VENDOR SUPPORT**

There is a 90-day warranty on parts and labor. Technical support is available from local distributors or the manufacturer.

---

### **JB-1260MA**

\$149.95

Information Systems, Inc.

#### **RATINGS**

A Overall rating  
B Price/performance  
A Ease of installation  
B Documentation  
A Vendor support

#### **FEATURES**

Type:	Composite
Size:	12"
Pixel resolution:	600 × 230
Text resolution:	80 × 25 (8 × 8 dots)
Sound channel:	-

## **PRODUCT SUMMARY**

The JB-1260MA is a monochrome monitor featuring a 12-inch screen with the brightness knob and the on/off switches in the front. The knobs for contrast, vertical/horizontal hold, vertical movement, size, and linearity are in the back. The monitor comes with a handle for easy carrying.

## **INTERFACING**

It uses the RCA phono jack for video input.

## **PERFORMANCE**

This model provides a clear, crisp display. Because the phosphor persistence is moderate, characters do not flicker. It is suitable for sprite animation, although the color monitors provide better resolution for this application.

## **VENDOR SUPPORT**

There is a 1-year warranty on labor; a 2-year warranty on parts. Technical support is available through local distributors, the manufacturer, or an 800 number.

---

### **Monitor IIe**

\$229.00

Apple Computer, Inc.

#### **RATINGS**

A Overall rating  
B Price/performance

#### **FEATURES**

Type:	Composite
Size:	12"

## RATINGS

A Ease of installation  
A Documentation  
B Vendor support

## FEATURES

Pixel	
resolution:	800
Text	
resolution:	80 × 25
Sound	
channel:	—

## PRODUCT SUMMARY

The Monitor *IIf* (Fig. 9-2) is designed to work with the Apple II, II+, and *IIf*, although it will also work with the Apple *IIc*. It is color coordinated with the Apple *IIf* and fits comfortably on top of that machine, as well as the Apple II and II+. Pixel resolution is 900 at the center and 800 at the corner. The display is green. It comes with a high-contrast, nonglare screen and adjustable screen tilt. Controls in the front include an on/off switch and contrast. Controls on the rear include brightness, vertical hold, and height. Internal controls adjust focus, vertical linearity, horizontal hold, horizontal size, and preset brightness.

## INTERFACING

The Monitor *IIf* uses the RCA jack for video input.

## PERFORMANCE

The Monitor *IIf* displays text in crisp, sharp, easy-to-view characters. The tilt function makes it easy to view the screen in a variety of different lighting situations. The phosphor persistence (P31) is sufficiently long to prevent image flickering, while not long enough to produce streaking. Graphics images are easy to view.

## VENDOR SUPPORT

Apple provides a 90-day warranty with the Monitor *IIf*. Repairs are handled through Apple's dealer service network.

---

## Monitor *IIc*

\$199.00

Apple Computer, Inc.

## RATINGS

A Overall rating  
B Price/performance  
A Ease of installation  
A Documentation

## FEATURES

Type:	Composite
Size:	9"
Pixel	
resolution:	800



Fig. 9-2. The Monitor IIc will work with all the members of the Apple II family (courtesy of Apple Computer, Inc.).

## RATINGS

B Vendor support

## FEATURES

Text

resolution: 80 × 25

Sound

channel: —

## PRODUCT SUMMARY

The Monitor IIc, with the optional Stand IIc (\$39.00), is designed to work with

the Apple *I*lc, although it will also work with the Apple II, II + , and *I*Ie. It is color coordinated with the Apple *I*lc and meshes nicely with that unit when combined with the stand. The display is green.

## INTERFACING

The Monitor *I*lc uses the RCA jack for video input.

## PERFORMANCE

The Monitor *I*lc displays text in crisp, sharp, easy-to-view characters, considering its 9-inch size. The phosphor persistence is sufficiently long to prevent image flickering, while not long enough to produce streaking. Graphics images are easy to view.

## VENDOR SUPPORT

Apple provides a 90-day warranty with the Monitor *I*lc. Repairs are handled through Apple's dealer service network.

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## Pi 1, Pi 2, Pi 3, and Pi 4

*Pi 2&3* 219.00

USI Products

### RATINGS

B Overall rating  
 B Price/performance  
 A Ease of installation  
 A Documentation  
 B Vendor support

### FEATURES

Type:	Composite
Size:	9" and 12"
Pixel	
resolution:	800 pixels
Text	
resolution:	
Sound	80 × 25
channel:	-

## PRODUCT SUMMARY

The Pi 1 and Pi 2 offer a green screen, while the Pi 3 and Pi 4 offer an amber screen. The Pi 1 and Pi 4 are 9-inch screens, and the Pi 2 and Pi 3 are 12-inch screens. All of these monochrome models offer a 20 MHz bandwidth, high resolution, and controls conveniently located in the front. A polarity switch, which enables you to view a normal or reverse display, is located in the back. On the 9-inch models, there is a 12-volt dc input for portability. The dc restorer switch locks in the black background, which is then unaffected by any adjustment in brightness. When the switch is turned to off, the black background displays all the shades of gray by adjustment of the brightness knob.

With these models you can daisy-chain more than one monitor using the video input/output connection.

## INTERFACING

Use the RCA jack in the back for video input.

## PERFORMANCE

These monitors all deliver clear, crisp characters. With a moderate phosphor persistence level, there was no flickering.

## VENDOR SUPPORT

There is a 90-day warranty on parts and labor. Technical support is available through local distributors or from the manufacturer.

---

### Princeton HX-12

\$695.00

Princeton Graphic Systems

#### RATINGS

A Overall rating  
A Price/performance  
B Ease of installation  
A Documentation  
A Vendor support

#### FEATURES

Type:	RGB
Size:	12"
Pixel	
resolution:	690 × 480
Text	
resolution:	
Sound	80 × 25
channel:	
	+

## PRODUCT SUMMARY

The Princeton HX-12 is the most popular color monitor used with personal computers. It is designed to work with the IBM PC, but will also work with the Apple *IIfx* with an adapter.

## INTERFACING

It plugs right into a standard RGB interface. The cable is included.

## PERFORMANCE

There is not much to be said about this monitor, except that it is the best we have seen. There is no bleeding of characters, even red on blue.

A real pleasure is the anti-glare screen provided with the monitor. After a few hours of work, your eyes do not feel strained or fatigued. Also, there are no flickers or ghosting of characters.

## VENDOR SUPPORT

There is a 1-year warranty on parts and service, which can be provided by Bell

and Howell Service Company, MAI Sorbus Service Company, or Xerox Service Company.

---

## RGB-1400PC Display

\$595.00

RGB Display Corporation

### RATINGS

- A Overall rating
- A Price/performance
- A Ease of installation
- A Documentation
- A Vendor support

### FEATURES

Type:	RGB
Size:	14"
Pixel	
resolution:	700 × 260
Text	80 × 25
resolution:	
Sound	-
channel:	

### PRODUCT SUMMARY

This is an RGB color display with the ability to display up to 32 colors simultaneously from a possible 4096. The superhigh-contrast glass is also glare resistant.

Test circuits have been provided to test color purity, red/blue convergence, and red/green/blue convergence. This is accessed by a small switch panel on the front.

Because of special circuit design, this monitor consumes less power and is smaller than most RGB monitors.

### INTERFACING

The RGB-1400PC Display requires an RGB interface card and cable.

### PERFORMANCE

The display quality is superb. For the money it is definitely one of the better monitors around.

### VENDOR SUPPORT

RGB Display corporation has an excellent policy for repair and backs its products well. The company also cooperates well with original equipment manufacturers.

---

## SC-100

\$329.00

Sakata U.S.A. Corporation

### RATINGS

- A Overall rating

### FEATURES

Type:	Composite
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**RATINGS**

- A Price/performance
- A Ease of installation
- B Documentation
- B Vendor support

**FEATURES**

- Size: 13"
- Pixel resolution: 300 × 280
- Text resolution: 40 × 24
- Sound channel: +

**PRODUCT SUMMARY**

The SC-100 color monitor features a large screen and an earphone jack on the front panel for private listening. The power on/off, volume, and contrast knobs are on the front panel. Brightness, color, and tint adjustment and the input/output jacks are in the back.

**INTERFACING**

The RCA jack in the back is used for both video and audio input.

**PERFORMANCE**

The resolution and color contrast are quite good, making this monitor suitable for graphics and games. The 40-column limit, however, makes this monitor unsuitable for heavy word processing.

With a low-to-moderate phosphor persistence, there is some flicker with light colors.

**VENDOR SUPPORT**

There is a 1-year warranty on parts and labor. Technical support is available through local distributors or the manufacturer's 800 number.

---

**SG-1000****\$129.00**

Sakata U.S.A. Corporation

**RATINGS**

- A Overall rating
- A Price/performance
- A Ease of installation
- B Documentation
- B Vendor support

**FEATURES**

- Type: Composite
- Size: 12"
- Pixel resolution: 800 lines
- Text resolution: 80 × 25 (5 × 7 dots)
- Sound channel: -

## PRODUCT SUMMARY

The SG-1000 monochrome monitor features a 12-inch screen and a high-resolution display. There are 2000 characters maximum in an 80- $\times$ -25 format. Pixel resolution is 900 at the center and 800 at the corner. The display is green. The on/off switch and brightness and contrast knobs are on the front panel. The monitor is equipped with a nonglare faceplate.

## INTERFACING

The SG-1000 uses the RCA jack for video input.

## PERFORMANCE

This monitor gives you crisp, sharp characters and does equally well in word processing and high-resolution graphics applications. It has a moderate phosphor persistence; so there is no flickering of the characters on the screen.

## VENDOR SUPPORT

There is a 1-year warranty on parts and labor. Technical support is available through local distributors, the manufacturer, or by calling the 800 number.

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## WORKSHEET FOR MONITORS

### PRODUCT

\$ .

### MANUFACTURER

### RATINGS

Overall rating  
Price/performance  
Ease of installation  
Documentation  
Vendor support

### FEATURES

Type:  
Size:  
Pixel  
resolution:  
Text  
resolution:  
Sound  
channel:

## PRODUCT SUMMARY

## INTERFACING

## PERFORMANCE

## VENDOR SUPPORT

Table 9-1. Comparative Ratings for Monochrome Monitors.

MONITOR	PRICE	RATINGS				
		1	2	3	4	5
CR-5400	\$100.00	B	B	A	A	C
CR-5600	150.00	B	B	A	A	C
JB-1260MA	149.95	A	B	A	B	A
Monitor //e	229.00	A	B	A	A	B
Monitor //c	199.00	A	B	A	A	B
Pi 1	159.00	B	B	A	B	B
Pi 2	219.00	B	B	A	B	B
Pi 3	219.00	B	B	A	B	B
Pi 4	159.00	B	B	A	B	B
SG-1000	129.00	A	A	A	B	B
<b>KEY TO RATINGS</b>						
1—Overall rating		4—Documentation				
2—Price/performance		5—Vendor support				
3—Ease of installation						

Table 9-2. Comparative Features for Monochrome Monitors.

PRODUCT	FEATURES				
	1	2	3	4	5
CR-5400	C	9	650	80 × 25	—
CR-5600	C	12	650	80 × 25	—
JB-01260MA	C	12	600 × 230	80 × 25	—
Monitor //e	C	12	800	80 × 25	—
Monitor //c	C	9	800	80 × 25	—
Pi 1	C	9	800	80 × 25	—
Pi 4	C	9	800	80 × 25	—
Pi 2	C	12	800	80 × 25	—
Pi 3	C	12	800	80 × 25	—
SG-1000	C	12	400 × 175	80 × 25	—
<b>KEY TO FEATURES</b>					
1—Type (C = Composite, R = RGB, M = Monochrome)			4—Text resolution		
2—Size			5—Sound channel		
3—Pixel resolution					

**Table 9-3. Comparative Ratings for Color Monitors.**

MONITOR	PRICE	RATINGS				
		1	2	3	4	5
Amdek Color 400	\$399.00	B	A	B	B	A
Amdek Color 500	525.00	A	A	B	B	A
Amdek Color 600	650.00	B	B	B	A	A
Amdek Color 710	799.00	B	B	B	B	A
AU 9191 U	349.00	B	B	A	B	B
Color I	329.00	A	A	A	B	A
CR-6500	350.00	B	B	A	A	C
Princeton HX-12	695.00	A	A	B	A	A
RGB-1400PC	595.00	A	A	A	A	A
SC-100	329.00	A	A	A	B	B
<b>KEY TO RATINGS</b>						
1—Overall rating		4—Documentation				
2—Price/performance		5—Vendor support				
3—Ease of installation						

**Table 9-4. Comparative Features for Color Monitors.**

PRODUCT	FEATURES				
	1	2	3	4	5
Amdek Color 400	R	13	380 × 240	40 × 25	+
Amdek Color 500	R	13	460 × 240	80 × 25	+
Amdek Color 600	R	13	640 × 240	80 × 25	+
Amdek Color 710	R	13	710 × 480	80 × 25	—
AU 9191 U	C	13	350 × 350	80 × 25	+
Color I	C	13	300 × 260	32 × 24	+
CR-6500	C	13	300 × 260	40 × 24	+
Princeton HX-12	R	12	690 × 480	80 × 25	+
RGB-1400PC Display	R	14	700 × 260	80 × 25	—
SC-100	C	13	300 × 320	40 × 24	+
<b>KEY TO FEATURES</b>					
1—Type (C = Composite, R = RGB, M = Monochrome)			4—Text resolution		
2—Size			5—Sound channel		
3—Pixel resolution					

# Chapter 10



## RGB Cards

Normal color display from an Apple computer, whether from the monitor output port or from an RF modulation, and whether displayed on a color television set or a color composite monitor, is generated by means of an NTSC (National Television Standards Commission) color composite signal. The use of this form of display signal limits the clarity and resolution of the color image.

Another method of generating a color display is by means of an RGB signal. This signal is inherently more clear and sharp. It must be displayed on a special monitor, known as an RGB monitor.

Even with an RGB monitor, however, you still need the source of an RGB signal to send to the monitor, and there is no built-in form of this signal on Apple computers. An RGB interface card provides the means of converting the NTSC signal on an Apple into an RGB signal capable of being displayed on an RGB monitor.

Many RGB cards go further than merely providing a converted RGB signal. They also provide 80-column display, often in a variety of text and background color—another feature missing on the standard Apple computers. In addition, you can produce a variety of low-, medium-, and high-resolution graphics. Some even come with software, which provides for the ability to display different windows of text.

## DVM-8OE

\$195.00

Amdek Corporation

### RATINGS

B Overall rating  
B Price/performance  
B Software compatibility  
A Ease of installation  
A Documentation  
A Vendor support

### FEATURES

Slot #:	Auxiliary
RAM:	64K
Text colors:	16
Double-resolution	
graphics:	+
Windows:	-

### PRODUCT SUMMARY

This card functions as both an extended 80-column card and an RGB interface for an Apple *IIfx*. It provides the following display modes:

- ☐ 40- or 80-column white- or color-selectable text.
- ☐ 16-color low-resolution graphics with 40 or 80 columns of text.
- ☐ 6-color high-resolution graphics with 40 or 80 columns of text.
- ☐ 40-column text with 16 foreground and 16 background colors.
- ☐ Double-resolution graphics.

---

## DVM-II

\$179.00

Amdek Corporation

### RATINGS

B Overall rating  
B Price/performance  
B Software compatibility  
A Ease of installation  
A Documentation  
A Vendor support

### FEATURES

Slot #:	1-7
RAM:	0
Text colors:	16
Double-resolution	
graphics:	-
Windows:	-

### PRODUCT SUMMARY

This is an RGB interface for the Apple II and II+. It will provide RGB output in the following modes:

- ☐ Standard or colored text.
- ☐ Standard high-resolution graphics in 6 colors.
- ☐ Standard low-resolution graphics in 15 to 16 colors.
- ☐ A monochromatic high-resolution graphics display.
- ☐ A 3-color plus pure white, high-resolution graphics display.

## RGB-SL7

\$149.95

Video-7 Incorporated

### RATINGS

B Overall rating  
A Price/performance  
B Software compatibility  
A Ease of installation  
B Documentation  
A Vendor support

### FEATURES

Slot #:	7
RAM:	0
Text colors:	16
Double-resolution graphics:	+
Windows:	-

### PRODUCT SUMMARY

This RGB interface is designed for the Apple II, II+, and IIe. In the Apple IIe it will supplement the display of an Apple 80-column card (regular or extended) or compatible 80-column card in the auxiliary slot. Display modes include:

- ☐ 40-column text in 16 colors.
- ☐ 80-column text in 2 colors in a IIe with an 80-column card.
- ☐ 16-color, low-resolution graphics with 40 columns of text (or 80 columns in a IIe with an 80-column card).
- ☐ 2-color, monochromatic, high-resolution graphics (280 by 192 pixels) with 40-column text.
- ☐ 6-color, high-resolution graphics with 40-column text (or 80 columns in a IIe with an 80-column card).
- ☐ 16-color, high-resolution graphics (140 by 192-pixels) with 80-column text on a IIe with an extended 80-column card.
- ☐ 16-color, double low-resolution graphics (80 by 40 blocks) with 80-column text on a IIe with an 80-column card.

---

## 64K RGB Interface

\$299.95

Video-7 Incorporated

### RATINGS

A Overall rating  
B Price/performance  
B Software compatibility  
A Ease of installation  
A Documentation  
A Vendor support

### FEATURES

Slot #:	Auxiliary
RAM:	64K
Text colors:	16
Double-resolution graphics:	+
Windows:	+

## PRODUCT SUMMARY

This combined RGB interface and extended 80-column card is designed for the Apple *IIfx*. Display modes include:

- ☐ 40- or 80-column text in white or four colors.
- ☐ 16-color, high-resolution graphics with 40- or 80-column text.
- ☐ 6-color, high-resolution graphics with 40- or 80-column text.
- ☐ 2-color, high-resolution graphics (560 by 192 pixels) with 80-column text.
- ☐ 16-color, high-resolution graphics (140 by 192 pixels) with 80-column text.
- ☐ 16-color, double low-resolution graphics (80 by 40 blocks) with 80-column text.
- ☐ 40-column text with 16 foreground and 16 background colors.
- ☐ Windows of either 560- $\times$ -192 monochrome graphics or 16-color, 140- $\times$ -192 graphics.

Optional Vcolor software is available (\$49.95). It implements the double-resolution graphics capabilities of an Apple *IIfx* with an extended 80-column card. It uses ampersand routines to:

- ☐ Switch between text and graphics screens.
- ☐ Change the "pen" color.
- ☐ Change the background or fill color.
- ☐ Clear all or a portion of the screen.
- ☐ Move the "pen."
- ☐ Draw a dot or line.
- ☐ Save or load part or all of the screen.
- ☐ Switch between the standard and user-defined text fonts.
- ☐ Draw defined shapes.

The software also includes a color mouse drawing program and a program to print the double high-resolution graphics screen to an Apple Dot Matrix Printer.

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## *IIfx* RGB Interface

\$199.95

Video-7 Incorporated

### RATINGS

A Overall rating  
B Price/performance  
B Software compatibility  
A Ease of installation  
A Documentation  
A Vendor support

### FEATURES

Slot #:	RGB port
RAM:	0
Text colors:	16
Double-resolution graphics:	+
Windows:	+



## PRODUCT SUMMARY

This peripheral functions as an RGB interface for an Apple *I/c*. It fits into the RGB output port on the back of the Apple *I/c*. Display modes include:

- ☐ 40- or 80-column text in white or four colors.
- ☐ 16-color, low-resolution graphics with 40- or 80-column text.
- ☐ 6-color, high-resolution graphics with 40- or 80-column text.
- ☐ 2-color, high-resolution graphics (560 × 192 pixels) with 80-column text.
- ☐ 16-color, high-resolution graphics (140 × 192 pixels) with 80-column text.
- ☐ 16-color, double low-resolution graphics (80 × 40 blocks) with 80-column text.
- ☐ Windows of either 560 × 192 monochrome graphics or 16-color 140- × -192 graphics.

Optional Vcolor software is available (\$49.95) which implements the double-resolution graphics capabilities of an Apple *I/e* with an extended 80-column card. It uses ampersand routines to:

- ☐ Switch between text and graphics screens.
- ☐ Change the "pen" color.
- ☐ Change the background or fill color.
- ☐ Clear all or a portion of the screen.
- ☐ Move the "pen."
- ☐ Draw a dot or line.
- ☐ Save or load part or all of the screen.
- ☐ Switch between the standard and user-defined text fonts.
- ☐ Draw defined shapes.

The software also include a color mouse drawing program and a program to print the double high-resolution graphics screen to an Apple Dot Matrix Printer.

---

## WORKSHEET FOR RGB CARDS

### PRODUCT

\$ .

### MANUFACTURER

#### RATINGS

Overall rating  
Price/performance  
Software compatibility  
Ease of installation  
Documentation  
Vendor support

#### FEATURES

Slot #:  
RAM:  
Text colors:  
Double-resolution  
graphics:  
Windows:

## PRODUCT SUMMARY

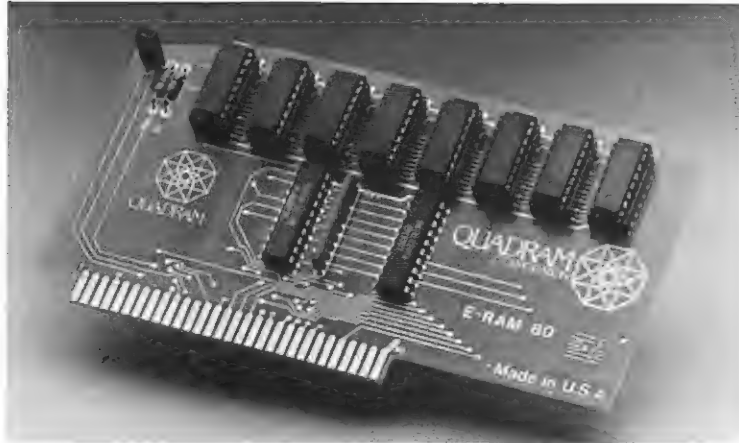
**Table 10-1. Comparative Ratings for RGB Cards.**

DEVICE	PRICE	RATINGS					
		1	2	3	4	5	6
DVM-80E	\$ 195.00	B	B	B	A	A	A
DVM-II	179.00	B	B	B	A	A	A
RGB-SL7	149.95	B	A	B	A	B	A
64K RGB Interface	299.95	A	B	B	A	A	A
//c RGB Interface	199.95	A	B	B	A	A	A
<b>KEY TO RATINGS</b>							
1—Overall rating				4—Ease of installation			
2—Price/performance				5—Documentation			
3—Software compatibility				6—Vendor support			

**Table 10-2. Comparative Features for RGB Cards.**

DEVICE	FEATURES				
	1	2	3	4	5
DVM-80E	Aux	64K	16	+	-
DVM-II	1-7	OK	16	-	-
RGB-SL7	7	OK	16	+	-
64K RGB Interface	Aux	64K	16	+	+
//c RGB Interface	RGB	OK	16	+	+
<b>KEY TO FEATURES</b>					
1—Slot # (Aux = Auxiliary port, RGB = RGB port)					
2—RAM			4—Double resolution graphics		
3—Text colors			5—Windows		

# Chapter 11



## Wide Display Cards

The Apple II, as it comes from the factory, is capable of only displaying 40 characters across each line. In a short time after its introduction, several companies developed peripheral devices which could display 80 characters across each line.

By the time the Apple *IIf* was developed, Apple itself had recognized this trend. The *IIf* came with a special slot, referred to as the auxiliary slot, which was specially designed for an 80-column display card. Apple itself had joined with the other companies that were offering 80-column display cards. This trend continued with the development of the Apple *IIf*, which provided a built-in 80-column display.

The 80-column display is widely used in most business applications today, in both microcomputers and their larger siblings. Many programs designed for the Apple either require an 80-column display or work better with one, including programs which work under the CP/M and p-System operating systems.

The prevalence of 80-column displays in the Apple II has spawned two separate trends. Some cards have gone beyond the standard 80 columns by 24 lines to offer up to 160 columns and 48 lines. These cards are useful in such applications as spreadsheets and word processing. Indeed, using a display screen of 80 columns and 48 lines displays nearly a full printed page of text at one time.

Other cards have built-in memory. This trend was started by Apple itself with its extended 80-column card which contains 64K of RAM. These cards, which only work with the Apple *IIf* and fit in the auxiliary slot, provide expanded memory on the Apple *IIf* in a manner similar to a RAM card on the Apple. These cards also provide the ability for the Apple *IIf* to display double high-resolution graphics. This

graphics mode permits display of 560 pixels across by 192 pixels down, instead of the normal 280 pixels by 192 pixels. In addition, you have your choice of 16 colors instead of the normal 6. Other cards offer up to 1 megabyte of RAM. The built-in 80-column "card" on the Apple *IIC* has 64K of added RAM.

In looking for a wide-display card, you should be aware of several things:

☐ The use of a card wider than 80 columns is not supported by many programs and often requires special preboots or modifications of existing programs to run. Manufacturers often supply preboots, sometimes at no cost. Be sure to inquire about availability from the manufacturer.

☐ Extra-wide-display cards often require high-persistence phosphor monitors and can be hard on the eyes under consistent use.

☐ Extra memory (extended) 80-column cards only work with the Apple *IIE* and only fit in the Apple *IIE*'s auxiliary slot. Much software written today for the *IIE* and *IIC* uses the extra 64K of memory. To use more memory than that you may need preboot software, often available at extra cost from the manufacturer of the card.

---

## Apple 80-Column Card

Standard—\$215.00

Apple Computer, Inc.

Extended—\$295.00

### RATINGS

A Overall rating  
A Price/performance  
A Software compatibility  
A Ease of installation  
B Documentation  
A Vendor support

### FEATURES

Slot used:	<i>IIE</i> auxiliary
Number of columns:	80
Number of lines:	24
Extra memory:	0 to 64K
Matrix size:	7 × 9
Softswitch:	+

### PRODUCT SUMMARY

The Apple 80-column card comes in two varieties. The standard version provides an 80-column display for an Apple *IIE*. The extended version provides 80-column display as well as 64K of extra memory which can be used by programs or as a RAM disk.

A number of programs make use of the extra 64K of memory on the extended 80-column card, including Appleworks and Bookends. In addition, some programs require a 128K Apple to run, including the "*IIC*" versions of Dollars and Sense and Bank Street Writer.

The card only works with the Apple *IIE*. It is not needed by the Apple *IIC*, which comes with a built-in extended 80-column card. Since the card is installed in the *IIE* auxiliary slot, it will not work with the Apple II or II+.

The card comes with a manual which explains its various functions. The con-

trol codes used by the Apple 80-column card have become standard for use of most software writers.

Another feature supplied by the extended 80-column card is the ability to display double-resolution graphics. This feature permits the use of high-resolution graphics images up to 560 pixels across by 192 pixels down (as opposed to  $280 \times 192$ ), and low-resolution "block" graphics of 80 blocks  $\times$  48 blocks (as opposed to  $40 \times 48$ ). Special software or machine-language programming is needed to utilize the double-resolution graphics routines made possible by the extended 80-column card.

The card works with DOS 3.3, ProDOS, the p-System, and CP/M. ProDOS will automatically use the extended memory as a RAM disk.

---

## eRAM 80

\$135.00

Quadram Corporation

### RATINGS

B Overall rating  
 A Price/performance  
 A Software compatibility  
 A Ease of installation  
 B Documentation  
 B Vendor support

### FEATURES

Slot used:	<i>I/Ie auxiliary</i>
Number of columns:	80
Number of lines:	24
Extra memory:	64K
Matrix size:	$8 \times 10$
Softswitch:	+

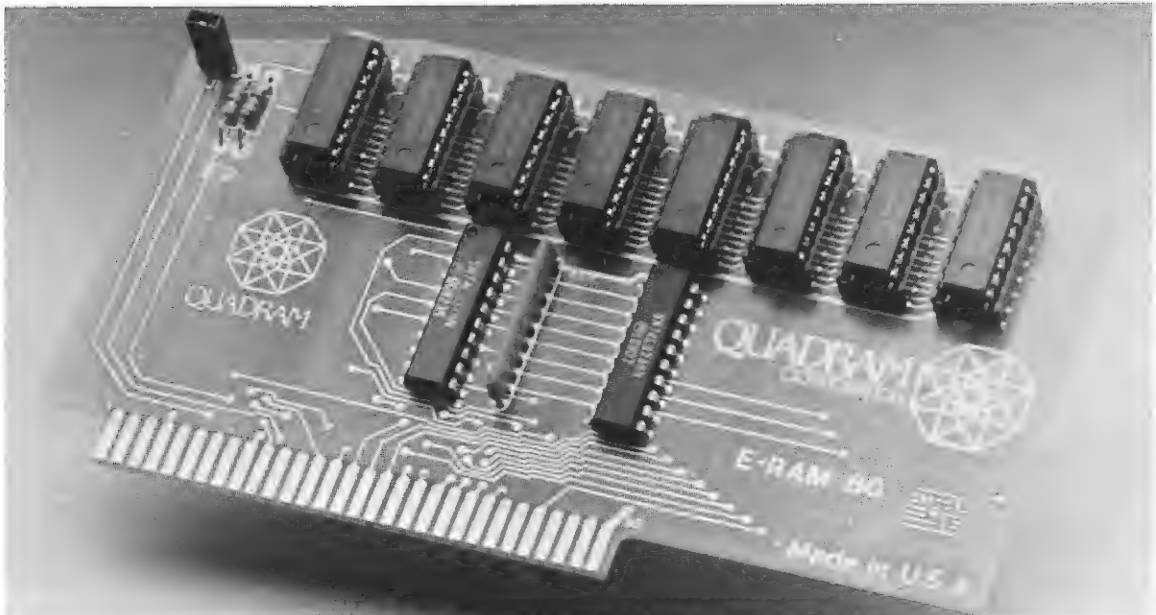


Fig. 11-1. The eRAM 80 will provide 80-column capability at a reasonable price (courtesy of Quadram Corporation).

## PRODUCT SUMMARY

The eRAM 80 (Fig. 11-1) is a standard, extended 80-column display card for the Apple *IIf*. It provides the features found in the Apple *IIf* extended 80-column display card for a cheaper price.

---

### Memory Master *IIf*

\$149.00 +

Applied Engineering

#### RATINGS

- A Overall rating
- A Price/performance
- A Software compatibility
- A Ease of installation
- B Documentation
- A Vendor support

#### FEATURES

Slot used:	<i>IIf</i> auxiliary
Number of columns:	80
Number of lines:	
Extra memory:	24
Matrix size:	64K to 1M
Softswitch:	8 × 10
	+

## PRODUCT SUMMARY

The Memory Master *IIf* comes in several varieties. The standard 64K, nonexpandable model sells for \$149.00 and emulates the Apple *IIf* extended 80-column display card. A model which comes with 64K and can be expanded to 128K by plugging in 64K RAM chips is \$169.00. A 128K RAM model is \$249.00. A newer model, available for \$189.00 in an expandable 64K version, can be expanded all the way up to 1 megabyte (M) of memory using 64K or 256K RAM chips.

The card is completely compatible with all Apple *IIf* 80-column and extended 80-column software. With VisiCalc, for example, it will automatically expand to 95K in 80 columns. With a 128K card and the optional VisiCalc preboot software (\$29.00), you can have up to 141K available for VisiCalc or 131K with Advanced VisiCalc *IIf*.

The card works with DOS 3.3, ProDOS, the p-System, and CP/M. ProDOS will automatically use the extended memory as a RAM disk.

A variety of optional software is available for \$29.00 each. RAMdrive *IIf* will allow use of the expanded memory (up to 128K) as a RAM disk in DOS 3.3 and the p-System. CP/M RAM Drive *IIf* gives you the same capability in CP/M. Appleworks Expand gives you 101K or workspace with a 128K Memory Master.

## **Smarterm II**

\$189.00

Advanced Logic Systems

### **RATINGS**

B Overall rating  
A Price/performance  
B Software compatibility  
B Ease of installation  
B Documentation  
B Vendor support

### **FEATURES**

Slot used: 3  
Number of columns: 80  
Number of lines: 24  
Extra memory: 0  
Matrix size: 5 × 7  
Softswitch: +

### **PRODUCT SUMMARY**

The Smarterm II is an 80-column display card designed for the Apple II and II+ and which will also work with the Apple IIe in slot 3. It does not emulate either the Apple IIe 80-column card nor the Videx card, which is nearly standard for the Apple II/II+. It is, however, compatible with AppleWriter II and several other programs without the need for special preboot software. It will also work automatically with CP/M in 80-column mode.

The card comes with both inverse and normal display built-in, as well as highlight and lowlight. It also has a built-in softswitch for switching between 80- and 40-column display.

An optional character set is available which uses a 7-×-11 matrix with true descenders. The normal character set does not have true descenders and takes some getting used to. There are also optional foreign language character sets. The card supports true shift key operation on a modified Apple II/II+ and on the Apple IIe.

---

## **Ultraterm**

\$379.00

Videx

### **RATINGS**

B Overall rating  
B Price/performance  
B Software compatibility  
A Ease of installation  
A Documentation  
A Vendor support

### **FEATURES**

Slot used: 3  
Number of columns: 80-160  
Number of lines: 24-48  
Extra memory: 0  
Matrix size: 8 × 9;  
8 × 12  
Softswitch: +

### **PRODUCT SUMMARY**

The Ultraterm is the first of the wide display cards to break the 80-column bar-

rier. It will display up to 160 characters across on an Apple II, II+, or IIe. It will display characters in either normal/inverse, or highlight/lowlight.

A variety of display sizes are provided: 40 × 24 (standard Apple screen), 80 × 24 (standard 80-column display), 80 × 32, 80 × 48, 96 × 24, 128 × 32, 132 × 24, and 160 × 24.

Many of the extra-wide or extra-long modes use interlacing in which the vertical dot spacing is half that normally used. For a workable display, interlacing requires a monitor with high-persistence phosphors. A monitor with a bandwidth of more than 15 MHz and minimal overscan is also needed. The ideal monitor for use with the Ultraterm is the Amdek 300A.

To install the Ultraterm, you merely plug it into slot 3, connect one cord to the video out jack, and plug the other cord into the monitor.

The Ultraterm is compatible with DOS 3.3, ProDOS, the p-System, and CP/M. It will support a lowercase input keyboard or permit use of the Control-A key as a shift toggle. In lowercase mode, it will automatically convert Applesoft and DOS commands to uppercase before passing them onto the operating system, thereby preventing one source of the dreaded "Syntax Error" message.

The card uses the standard cursor control commands, including the left and right arrows. The up and down arrow on the Apple IIe is not supported.

Built into the character set are 7 block-graphics characters and a set of 15 line-drawing characters. You can also select displays of monetary symbols, such as the lira, yen, mark, franc, and pound, as well as international accent marks.

The card supports standard Applesoft commands, such as HOME, NORMAL, INVERSE, as well as VTAB (to line 24) and HTAB (to column 80). Tabbing to locations below line 24 and beyond column 40 requires poking values into memory.

The manual discusses how to patch the WordStar CP/M word processor program to allow use of the 80-×-48 display mode, thereby permitting display of nearly a full page of text at a time. The card will use the extended memory of an Apple IIe 80-column card if that card is present in the auxiliary slot.

---

## Videoterm

\$279.00

### Videx

#### RATINGS

- A Overall rating
- B Price/performance
- A Software compatibility
- B Ease of installation
- A Documentation
- A Vendor support

#### FEATURES

- |                    |          |
|--------------------|----------|
| Slot used:         | 3        |
| Number of columns: | 80       |
| Number of lines:   | 24       |
| Extra memory:      | 0        |
| Matrix size:       | 8 × 10   |
| Softswitch:        | optional |



## PRODUCT SUMMARY

The Videoterm is the "standard" 80-column display card for the Apple II and II+. It permits display of 80 columns of text and uses commands that have been built into much software. It can also be used on the Apple IIe in slot 3, but not in the auxiliary slot.

The card itself is relatively easy to install. A variety of options which can make the chore more difficult and expensive are available, however, although they make using the Videoterm considerably nicer.

To install the Videoterm, you merely plug it into slot 3 and plug the monitor cord into the supplied cord. The video connector also has a light pen jack, although no light pen is available for this jack. Unfortunately, the basic Videoterm displays 80 columns of text. To show 40-column text, you must unplug the monitor cord and plug it back into the video out jack on your Apple. To avoid this unplugging and replugging, Videx supplies you with two options. A manual switch plate (\$19.00) installs on the back of your Apple. You simply move the switch from 40- to 80-column mode. The softswitch (\$35.00) does the same automatically, switching from 40- to 80-column display whenever the output from the 80-column card is active. Installation of the softswitch, however, requires the removal of a chip from the Apple motherboard and reinstallation of it on the softswitch circuitry. It is not a difficult procedure, but pulling and reinserting chips always presents the potential of bending or breaking the pins.

The main character set on the Videoterm comes with 8 block-graphic characters, 16 line-drawing characters, and 8 control-code function abbreviations (backspace, horizontal tab, line feed, vertical tab, form feed, carriage return, shift out, and shift in). There are a number of optional foreign language and line-drawing character sets (\$29.00 each) as well as an inverse display (\$29.00). Each optional display set consists of a chip which is plugged into the optional set location on the Videoterm.

The Applesoft commands NORMAL and INVERSE do not work with the Videoterm. Instead, to shift between the regular display and the optional one (inverse or other) you send a Control-N (for normal display) and Control-O (for other). In addition, the HOME command does not clear the screen. Instead, you must send the card a form feed (Control-L or CHR\$(12) code).

You can purchase a highlight/lowlight character set. It consists of two chips (\$49.00) which replace both the normal and the optional chips. The manual also contains complete directions on how to burn your own EPROM character sets.

A variety of ways to switch between upper- and lowercase input is supported. If you have installed the shift key wire modification on the Apple II or II+, the card will respond to this. If you have full upper/lowercase key board (either an Apple IIe or a modified II or II+), the card will recognize this input. In addition you can use the Control-A character as a shift key.

The card works with ProDOS, DOS 3.3, CP/M, and the p-System. The size and flash rate of the cursor is user-definable.

Optional software available for the Videoterm includes a preboot to provide 80-column display for Apple Writer II (\$19.00) and VisiCalc (\$49.00 or \$89.00) for optional memory expansion using RAM cards.

## Viewmaster

\$179.00

Applied Engineering

### RATINGS

A Overall rating  
A Price/performance  
A Software compatibility  
A Ease of installation  
B Documentation  
A Vendor support

### FEATURES

Slot used: 3  
Number of columns: 80  
Number of lines: 24  
Extra memory: 0  
Matrix size: 7 × 9  
Softswitch: +

### PRODUCT SUMMARY

The Viewmaster is a totally Videx-compatible, 80-column display card. It comes with standard video connectors and a built-in softswitch with a manual override. There are optional power and light pen input connectors, although no light pen is currently available for the connectors.

The display uses true descenders. The cursor shape is user-definable. The firmware supports full on-screen editing commands.

The card uses CMOS chip technology, resulting in low power draw on the Apple power supply. This is a very desirable feature, particularly for an 80-column display card which traditionally uses a great deal of power.

The card is supported by Applied Engineering's standard 3-year warranty, an unusually long period for computer hardware.

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## WORKSHEET FOR WIDE DISPLAY CARDS

### PRODUCT

\$ .

### MANUFACTURER

#### RATINGS

Overall rating  
Price/performance  
Software compatibility  
Ease of installation  
Documentation  
Vendor support

#### FEATURES

Slot used:  
Number of  
columns:  
Number of lines:  
Extra memory:  
Matrix size:  
Softswitch:

### PRODUCT SUMMARY

**Table 11-1. Comparative Ratings for Wide Display Cards.**

DEVICE	PRICE	RATINGS					
		<u>1 2 3 4 5 6</u>					
Apple 80 Column	standard	\$215.00	A	A	A	A	B A
	extended	295.00	A	A	A	A	B A
eRAM 80		135.00	B	A	A	A	B B
Memory Master II/e		149.00 +	A	A	A	A	B A
Smarterm II		189.00	B	A	B	B	B B
Ultraterm		379.00	B	B	B	A	A A
Videoterm		279.00	A	B	A	B	A A
Viewmaster		179.00	A	A	A	A	B A
<b>KEY TO RATINGS</b> 1—Overall rating 2—Price/performance 3—Software compatibility 4—Ease of installation 5—Documentation 6—Vendor support							

**Table 11-2. Comparative Features for Wide Display Cards.**

DEVICE	FEATURES					
	1	2	3	4	5	6
Apple 80 Column	II/e Aux	80	24	0/64K	7×9	+
eRAM 80	II/e Aux	80	24	64K	8×10	+
Memory Master II/e	II/e Aux	80	24	64K/1mg	8×10	+
Smarterm II	3	80	24	OK	5×7	+
Ultraterm	3	80/160	24/48	OK	8×9/	+
					8×12	+
Videoterm	3	80	24	OK	8×10	optional
Viewmaster	3	80	24	OK	7×9	+
<b>KEY TO FEATURES</b> 1—Slot used 2—Number of columns 3—Number of lines 4—Extra memory 5—Matrix size 6—Softswitch						

# Chapter 12



## Disk Drives

Most programs for the Apple II family are written on diskettes; disks are more efficient than cassettes. For this reason we will only deal with disks and disk drives in this book. (In addition, cassettes do not work with the Apple IIc at all.) We will assume you are familiar with floppy disks containing data and how they are inserted into the disk drive.

A disk drive looks for information randomly (vs. sequentially), and therefore operates up to 10 times faster than cassettes. For example, with a disk drive you can go directly to a specific file without having to run through all the files ahead of it on the disk. This procedure is very efficient and eliminates time spent searching through unwanted material.

A disk is a permanent record of data until it is erased, whereas the computer memory is a temporary record and can be lost when the computer is turned off. Copies of disks are easily made; so you will be able to permanently store your information in more than one place.

### DISK DRIVE OPERATION

The disk drive must be compatible with your computer. The disk drive performs a number of different jobs, which are controlled and managed either by the Disk Operating System (DOS), a set of programs, or by the disk controller, which is a set of integrated circuits. The commands used by DOS will vary with each system. For example, one system may use the command SAVE, while another system will refer to this same action as STORE.

Using the DOS, the disk drive will store programs or files on a disk, search for and retrieve a particular program or file on a disk, copy files from a disk, erase material, and keep a directory of the disk's contents.

The directory is a record of a file and its location on the disk. When you want to work with a particular file, use the proper DOS command and the filename. The disk drive refers to the directory and locates the file for you. After you create a file and write it onto the free space on the disk, it is automatically entered in the directory.

Another function of the disk drive is the preparation of the disk of use, called *formatting the disk*. It prepares the disk to accept certain data structures. Each new disk must be formatted before use. If you format a used disk, all information on it is erased.

## **DISKETTES IN GENERAL**

For the purposes of this book and with respect to the Apple we refer to a disk as one which is 5 1/4 inches square (other disks may be larger or smaller) and has a hole in the center. It is made out of mylar and is specially coated with iron oxide particles, which act as magnets. This magnetic surface is acted upon by the disk drive in recording, transferring, or reading information. The disk itself is enclosed in a vinyl jacket with an opening that exposes a small part of the disk. The diskettes must be compatible with your disk drive.

There is a small notch cut into the side of the disk. When this notch is covered with an adhesive tab, you are prevented from writing more information on this disk or erasing any information from it. You can, however, read the disk. Covering the notch is referred to as *write protection*, and is mainly used to keep you from accidentally erasing the contents of the disk.

When the disk is inserted and the disk drive door closed, a hub raises and fills the hole in the disk. Then a gripper lowers and spins the disk. The read/write head reads or writes information on the disk through the opening in the jacket.

Like the grooves on a record, a disk contains tracks to hold information. The number of tracks will vary with each disk drive. Each sector contains 256 bytes, and each byte is made up of 8 bits. The number of tracks on a disk determines its density: single-density, double-density, or quad-density. The higher the density, the more sophisticated the disk drive must be. Some disks are double-sided, and information can be recorded on both sides of the disk.

## **REVIEWS**

We have reviewed the drives which are compatible with the Apple, and you may judge which model suits your particular needs. We have also provided information on the type of diskette compatible with each disk drive.

Two items to remember in looking for a disk drive are the number of files or programs which the diskette can store and the number of characters which can be stored on the diskette. One page of single-spaced typing will use up about 4,000 bytes.

## **Apple Disk IIe**

Disk only—\$329.00

Apple Computer, Inc.

Controller and ProDOS—\$429.00

TYPE: Standard floppy drive

### **RATINGS**

- A Overall rating
- B Price/performance
- A Software compatibility
- A Ease of installation
- A Documentation
- A Vendor support

### **PRODUCT SUMMARY**

The Apple Disk IIe is the standard, full-height, 35-track, Apple disk drive. It handles 5 1/4-inch single-sided floppy disks that are either single or double density. The controller card handles up to two disk drives. When purchasing the drive and controller card, you also get the ProDOS disk operating system.

---

## **Apple Disk IIc**

\$329.00

Apple Computer, Inc.

TYPE: Half-height floppy drive

### **RATINGS**

- A Overall rating
- B Price/performance
- A Software compatibility
- A Ease of installation
- A Documentation
- A Vendor support

### **PRODUCT SUMMARY**

The Apple Disk IIc is a half-height, 35-track, Apple disk drive with a connector to be inserted into the add-on disk port on the Apple IIc. It handles 5 1/4-inch single-sided floppy disks that are either single or double density.

## **A2 Drive**

**\$299.00**

Microsci

**TYPE:** Standard floppy drive

### **RATINGS**

- A Overall rating
- B Price/performance
- A Software compatibility
- A Ease of installation
- A Documentation
- A Vendor support

### **PRODUCT SUMMARY**

This is a standard, 35-track, full-height, floppy disk drive. It is a direct substitute for the Apple IIe disk drive.

---

## **A82 Drive**

**\$329.00**

Apple Computer Inc.

**TYPE:** 80-track floppy drive

### **RATINGS**

- A Overall rating
- B Price/performance
- A Software compatibility
- B Ease of installation
- A Documentation
- B Vendor support

### **PRODUCT SUMMARY**

This is an 80-track, full-height, floppy disk drive. It requires a modified operating system and comes with instructions to modify DOS, Pascal, and CP/M. The disk is a bit hard to use. You must push the disk in against a spring to insert it and press an ejection button to remove it.

## **AP-100 Drive**

\$295.00

Quentin Research, Inc.

TYPE: Standard floppy drive

### **RATINGS**

- A Overall rating
- B Price/performance
- A Software compatibility
- A Ease of installation
- A Documentation
- A Vendor support

### **PRODUCT SUMMARY**

The AP-100 Drive is a standard, 35-track, full-height, floppy disk drive which is a direct substitute for the Apple *IIe* disk drive. It uses an optical track 0 switch, which results in quieter operation.

---

## **AP-105 Drive**

\$285.00

Quentin Research, Inc.

TYPE: Half-height floppy drive

### **RATINGS**

- A Overall rating
- B Price/performance
- A Software compatibility
- A Ease of installation
- A Documentation
- A Vendor support

### **PRODUCT SUMMARY**

This is a standard, half-height, floppy disk drive. It functions as an Apple *IIe* disk drive but takes only half the space. It uses an optical track 0 switch which results in quieter operation.

---

## **AP-110 Double Drive**

\$595.00

Quentin Research, Inc.

TYPE: Double half-height drive



## **RATINGS**

- A Overall rating
- B Price/performance
- A Software compatibility
- A Ease of installation
- A Documentation
- A Vendor support

## **PRODUCT SUMMARY**

The AP-110 features two half-height, 35-track disk drives plus a controller card. It handles 5 1/4-inch floppy disks that are single-sided and either single- or double-density. It uses an optical track 0 switch, which results in quieter operation.

---

## **AP-120 Disk Controller**

\$65.00

Quentin Research, Inc.

TYPE: Disk controller card

## **RATINGS**

- A Overall rating
- B Price/performance
- A Software compatibility
- A Ease of installation
- A Documentation
- A Vendor support

## **PRODUCT SUMMARY**

The AP-120 Disk Controller is an Apple-compatible disk controller card. It will fit in any slot on the Apple motherboard and handle up to two drives.

---

## **APS-M Drive**

\$229.95

Micro-Design

TYPE: Half-height floppy drive

## **RATINGS**

- A Overall rating
- B Price/performance
- A Software compatibility
- A Ease of installation
- A Documentation
- A Vendor support

## PRODUCT SUMMARY

This is a standard, half-height floppy disk drive. It functions as an Apple *IIfx* disk drive but takes only half the space. It uses a direct-drive mechanism.

---

**C-111**

**\$249.00**

Concorde Peripheral Systems, Inc.

TYPE: Standard floppy drive

## RATINGS

- A Overall rating
- B Price/performance
- A Software compatibility
- A Ease of installation
- A Documentation
- A Vendor support

## PRODUCT SUMMARY

This is a standard, 35-track, full-height floppy disk drive which is a direct substitute for the Apple *IIfx* disk drive.

---

**C-130**

**\$89.00**

Concorde Peripheral Systems Inc.

TYPE: Disk controller card

## RATINGS

- A Overall rating
- B Price/performance
- A Software compatibility
- A Ease of installation
- A Documentation
- A Vendor support

## PRODUCT SUMMARY

The C-130 is an Apple-compatible disk controller card. It will fit in any slot on the Apple motherboard. Unlike the Apple controller which will handle up to two drives, the C-130 handles up to four drives per controller. The use of more than two drives requires a patch to the operating system.

## **DD Controller**

**\$49.95**

Micro-Design

TYPE: Disk controller card

### **RATINGS**

- A Overall rating
- B Price/performance
- A Software compatibility
- A Ease of installation
- A Documentation
- A Vendor support

### **PRODUCT SUMMARY**

The DD Controller is an Apple-compatible disk controller card. It will fit in any slot on the Apple motherboard and handle up to two drives.

---

## **Distar**

**\$189.00**

Burke & Associates

TYPE: Half-height floppy drive

### **RATINGS**

- A Overall rating
- B Price/performance
- A Software compatibility
- A Ease of installation
- A Documentation
- A Vendor support

### **PRODUCT SUMMARY**

The Distar is a standard, half-height, direct-drive floppy disk drive. It functions as an Apple IIe disk drive but takes only half the space.

---

## **Distar DuoDrive**

**\$399.00**

Burke & Associates

TYPE: Double half-height drive

## **RATINGS**

- A Overall rating
- B Price/performance
- A Software compatibility
- A Ease of installation
- A Documentation
- A Vendor support

## **PRODUCT SUMMARY**

The Distar DuoDrive features two half-height, 35-track disk drives as well as controller card. It handles 5 1/4-inch floppy disks that are single-sided and either single- or double-density.

---

### **Duodisk**

\$729.00

Apple Computer, Inc.

TYPE: double half-height unit

## **RATINGS**

- A Overall rating
- B Price/performance
- A Software compatibility
- A Ease of installation
- A Documentation
- A Vendor support

## **PRODUCT SUMMARY**

The Duodisk (Fig 12-1) features two half-height, 35-track disk drives and a controller card. It handles 5 1/4-inch floppy disks that are single-sided and either single- or double-density.

---

### **Elite 1**

\$349.00

Rana Systems

TYPE: 40-track floppy drive

## **RATINGS**

- A Overall rating
- B Price/performance
- A Software compatibility



Fig. 12-1. The Duodisk by Apple has a built-in controller card (courtesy of Apple Computer, Inc.).

### **RATINGS**

- A Ease of installation
- A Documentation
- A Vendor support

### **PRODUCT SUMMARY**

The Elite 1 is a 40-track, full-height floppy disk drive. It functions as an Apple *IIfx* disk drive and, with appropriate patches to the operating system, as a disk drive which can handle disks with a capacity of 171K. Like all Rana Elite drives (Fig. 12-2), it features a write protect switch and an LED write protect indicator.

---

## **Elite 2**

\$549.00

Rana Systems

TYPE: Double-sided 40-track drive

### **RATINGS**

- A Overall rating
- B Price/performance



Fig. 12-2. Rana Systems makes three Elite drives for the Apple (courtesy of Rana Systems).

## RATINGS

- A Software compatibility
- A Ease of installation
- A Documentation
- A Vendor support

## PRODUCT SUMMARY

This is a double-sided, full-height drive featuring 40 tracks on each side. It functions as an Apple IIe disk drive and, with appropriate patches to the operating system, as a disk drive which can handle double-sided disks with up to 80 tracks or 320K per disk. Like all Rana Elite drives, it features a write protect switch and an LED write protect indicator.

---

### Elite 3

\$749.00

Rana Systems

TYPE: Double-sided 80-track drive

## **RATINGS**

A Overall rating  
B Price/performance  
A Software compatibility  
A Ease of installation  
A Documentation  
A Vendor support

## **PRODUCT SUMMARY**

This is a double-sided, full-height drive featuring 80 tracks on each side (double-density). It functions as an Apple *IIfx* disk drive and, with appropriate patches to the operating system, as a disk drive which can handle double-sided disks with up to 160 tracks or 640K per disk. Like all Rana Elite drives, it features a write protect switch and an LED write protect indicator.

---

### **Elite Controller**

\$125.00

Rana Systems

TYPE: Disk controller card

## **RATINGS**

A Overall rating  
B Price/performance  
A Software compatibility  
A Ease of installation  
A Documentation  
A Vendor support

## **PRODUCT SUMMARY**

This is an Apple-compatible disk controller card (Fig. 12-3). It will fit in any slot on the Apple motherboard. Unlike the Apple controller, which will handle up to two drives, the Elite Controller handles up to four drives per controller. The use of more than two drives requires a patch to the operating system. The controller results in track-to-track speed that is three times faster and automatic booting of 13- and 16-sector Apple disks.

---

### **MiniTaur**

\$199.00

RGB Designs

TYPE: Half-height floppy drive

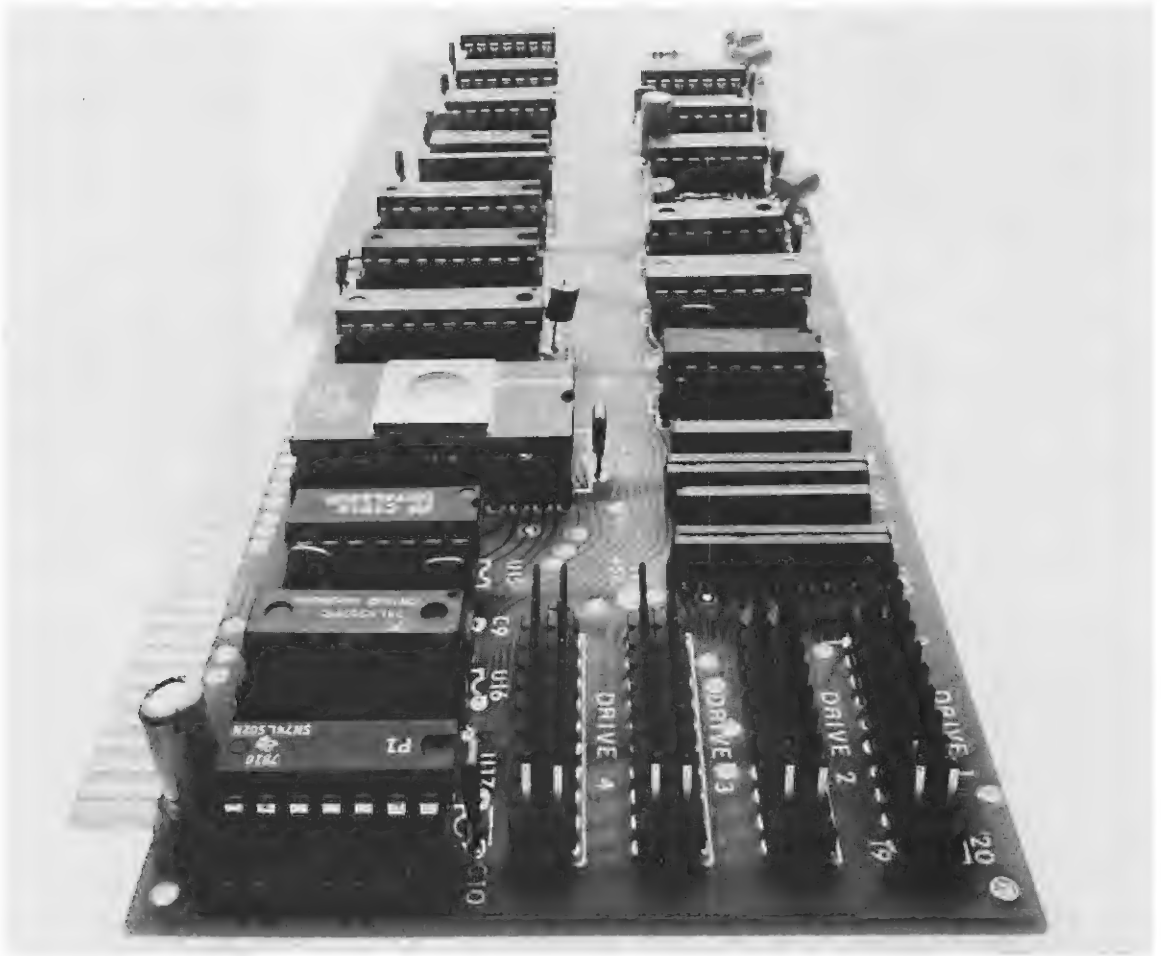


Fig. 12-3. The Elite Controller will handle up to four disk drives (courtesy of Rana Systems).

## RATINGS

- B Overall rating
- B Price/performance
- A Software compatibility
- A Ease of installation
- B Documentation
- B Vendor support

## PRODUCT SUMMARY

The MiniTaur is a standard, half-height floppy disk drive. It functions as an Apple IIe disk drive but takes only half the space.



## **Mochinon Drive**

\$199.95

Micro-Design

TYPE: Half-height floppy drive

### **RATINGS**

- A Overall rating
- B Price/performance
- A Software compatibility
- A Ease of installation
- A Documentation
- A Vendor support

### **PRODUCT SUMMARY**

This is a standard half-height floppy disk drive. It functions as an Apple *IIfx* disk drive but takes only half the space. It uses a belt-drive mechanism.

---

## **Pace AP Standard Drive**

\$349.00

Pace Systems

TYPE: Standard floppy drive

### **RATINGS**

- A Overall rating
- B Price/performance
- A Software compatibility
- A Ease of installation
- A Documentation
- A Vendor support

### **PRODUCT SUMMARY**

This is a standard 35-track, full-height floppy disk drive which is a direct substitute for the Apple *IIfx* disk drive. It uses the Alps slim-line mechanism.

---

## **Pace AP Half Height**

\$349.00

Pace Systems

TYPE: Half-height floppy drive

## **RATINGS**

- A Overall rating
- B Price/performance
- A Software compatibility
- A Ease of installation
- A Documentation
- A Vendor support

## **PRODUCT SUMMARY**

This is a standard half-height floppy disk drive. It functions as an Apple *IIfx* disk drive but takes only half the space. It features the Alps slim-line mechanism.

---

### **Pace AP 2-in-1 Drive**

\$645.00

Pace Systems

TYPE: Double half-height drive

## **RATINGS**

- A Overall rating
- B Price/performance
- A Software compatibility
- A Ease of installation
- A Documentation
- A Vendor support

## **PRODUCT SUMMARY**

The Pace AP 2-In-1 Drive features two half-height, 35-track disk drives plus a controller card. It handles 5 1/4-inch floppy disks that are single-sided and either single- or double-density. It features the Alps slim-line mechanism.

---

### **PPW Drive**

\$170.00

PPW Inc.

TYPE: 40-track floppy drive

## **RATINGS**

- A Overall rating
- B Price/performance
- A Software compatibility

### **RATINGS**

- A Ease of installation
- A Documentation
- A Vendor support

### **PRODUCT SUMMARY**

This is a 40-track, full-height, floppy disk drive. It functions as an Apple *IIfx* disk drive and, with appropriate patches to the operating system, as a disk drive which can handle disks with a capacity of 171K.

---

## **SA390-E Drive**

\$219.95 ·

Micro-Design

TYPE: Standard floppy drive

### **RATINGS**

- A Overall rating
- B Price/performance
- A Software compatibility
- A Ease of installation
- A Documentation
- A Vendor support

### **PRODUCT SUMMARY**

This is a standard, 35-track, full-height floppy disk drive which is a direct substitute for the Apple *IIfx* disk drive.

---

## **Taur II**

\$219.00

RGB Designs

TYPE: Standard floppy drive

### **RATINGS**

- A Overall rating
- A Price/performance
- A Software compatibility
- A Ease of installation
- B Documentation
- B Vendor support

## PRODUCT SUMMARY

This is a standard, 35-track, full-height floppy disk drive which is a direct substitute for the Apple *IIfx* disk drive.

---

**Taur II +**

\$239.00

RGB Designs

TYPE: 40 track floppy drive

## RATINGS

B Overall rating  
B Price/performance  
B Software compatibility  
A Ease of installation  
B Documentation  
B Vendor support

## PRODUCT SUMMARY

This is a 40-track, full-height floppy disk drive. It functions as an Apple *IIfx* disk drive and, with appropriate patches to the operating system, as a disk drive which can handle disks with a capacity of 171K.

---

**Vista Solo**

Drive only—\$299.00

Vista Computer

Drive with controller—\$379.00

TYPE: Standard floppy drive

## RATINGS

A Overall rating  
B Price/performance  
A Software compatibility  
A Ease of installation  
A Documentation  
A Vendor support

## PRODUCT SUMMARY

This is a standard, 35-track, full-height floppy disk drive which is a direct substitute for the Apple *IIfx* disk drive.

## V1200

\$1500.00

Vista Computer

TYPE: Special disk drive

### RATINGS

- A Overall rating
- B Price/performance
- A Software compatibility
- A Ease of installation
- A Documentation
- A Vendor support

### PRODUCT SUMMARY

The V1200 looks like a disk drive unit designed by Rube Goldberg. It consists of five special high-density floppies, each holding 1.2 megabytes of formatted storage, for a total of 6 megabytes of formatted storage. When necessary, the disk currently in the drive is automatically switched out and another disk switched in. The time for disk-to-disk changes can be a bit slow.

The unit supports DOS 3.3, ProDOS, CP/M, and Pascal. The CP/M supported is version 2.2; it will not work with CP/M 3.0. Each disk has its own operating system. When you switch between operating systems, the V1200 switches the active disk.

Compatibility is difficult; you can use the V1200 for data storage if the program uses a standard operating system for its storage. Protected programs which use a special operating system do not work on the V1200.

Since the V1200 is designed on floppy disks, not hard disks, there is not a significant disk I/O speedup when using the V1200. Backup is accomplished by copying from one disk to another, a process which can take over 1/2 hour per disk.

The V1200 comes with a drive, controller card, cable, manual, and its own power supply with a fan and a switch. Replacement disks are about \$75.00 for a package of five.

---

### WORKSHEET FOR DISK DRIVES

#### PRODUCT

\$

#### MANUFACTURER

TYPE:

#### RATINGS

- Overall rating
- Price/performance

## RATINGS

Software compatibility

Ease of installation

Documentation

Vendor support

## PRODUCT SUMMARY

Table 12-1. Comparative Ratings for Disk Drives.

DEVICE	TYPE	PRICE	RATINGS					
			1	2	3	4	5	6
Apple Disk //e	ST		A	B	A	A	A	A
w/disk only		\$ 329.00						
w/Controller and ProDOS		429.00	A	B	A	A	A	A
Apple Disk //c	HH	329.00	A	B	A	A	A	A
A2 Drive	ST	299.00	A	B	A	A	A	A
A82 Drive	80	329.00	A	B	A	B	A	B
AP-100 Drive	ST	295.00	A	B	A	A	A	A
AP-105 Drive	HH	285.00	A	B	A	A	A	A
AP-110 Double Drive	DH	595.00	A	B	A	A	A	A
AP-120 Disk Controller	DC	65.00	A	B	A	A	A	A
APS-M Drive	HH	229.95	A	B	A	A	A	A
C-111	ST	249.00	A	B	A	A	A	A
C-130	DC	89.00	A	B	A	A	A	A
DD Controller	DC	49.95	A	B	A	A	A	A
Distar DuoDrive	DH	399.00	A	B	A	A	A	A
Duodisk	DH	729.00	A	B	A	A	A	A
Elite 1	40	349.00	A	B	A	A	A	A
Elite 2	DS/40	549.00	A	B	A	A	A	A
Elite 3	DS/80	749.00	A	B	A	A	A	A
Elite Controller	DC	125.00	A	B	A	A	A	A
MiniTaur	HH	199.00	B	B	A	A	B	B
Mochinon Drive	HH	199.95	A	B	A	A	A	A
Pace AP Standard Drive	ST	349.00	A	B	A	A	A	A
Pace AP Half Height	HH	349.00	A	B	A	A	A	A
Pace AP 2-in-1 Drive	DH	645.00	A	B	A	A	A	A
PPW Drive	40	170.00	A	B	A	A	A	A
SA390-E Drive	ST	219.95	A	B	A	A	A	A
Taur II	ST	219.00	A	A	A	A	B	B
Taur II +	40	239.00	B	B	B	A	B	B
Vista Solo w/drive	ST	299.00	A	B	A	A	A	A
w/controller		379.00	A	B	A	A	A	A
V1200	SP	1500.00	A	B	A	A	A	A
KEY TO RATINGS			TYPE					
1—Overall rating			ST—Standard					
2—Price/performance			HH—Half height					
3—Software compatibility			80—80 track					
4—Ease of installation			DH—Double half height					
5—Documentation			DC—Disk controller					
6—Vendor support			40—40 track					
			DS—Double sided					
			SP—Special					

# Chapter 13



## Hard Disk Drives and Local Area Networks

### HARD DISK DRIVES

As the number and complexity of the tasks you perform on a Apple increase, the storage capacity of a single-sided disk drive quickly becomes inadequate. There are at least three good solutions to this problem:

- ☐ Add additional external drives, one on the Apple *IIfx* and as many as seven on the Apple *IIfx*.
- ☐ Add external high density 5 1/4-inch diskette drives (320K or 640K).
- ☐ Add one or more hard disk drives. There are a wide variety of drives available from five to hundreds of megabytes.

There is a great deal to be said for the diskette route. Having two high-capacity, removable media drives makes backup simple and fast. The removable media effectively increases the available storage because you can swap diskettes as needed. When more than about a megabyte is needed, however, or when the faster access of the hard disk is important, hard disk becomes the media of choice. High-capacity diskette drives still deserve consideration as backup media and for additional, easily changeable storage.

### HARD DISKS

Once you have determined that you have a need for a hard disk instead of, or in addition to, high-capacity diskette storage, the problem is to make an intelligent

choice among the many hard disks available. Even the simple “buy it from Apple” strategy is not totally effective, since Apple gets its hard disk drives from other companies. The reviews at the end of this chapter will provide some guidance in this complex field.

The prices of hard disks are changing so rapidly that you may need to verify the prices before you make a decision. Removable media or other special features will, of course, increase the price.

Backing up a hard disk is a problem of a different order of magnitude from backing up one floppy to another. There are four principal backup methods:

- ☐ Tape cartridges
- ☐ Removable hard disk
- ☐ Ultrahigh-density floppy
- ☐ Standard diskettes

The first three strategies are the most effective, since they are fast and convenient. In many cases a backup system is incorporated with the hard disk as a single peripheral. All methods except using existing floppies as backup involve extra expense.

To backup all 10 megabytes of your hard disk on standard floppies will take as many as 60 diskettes (if the hard disk is filled with data and programs). The process will take as long as several hours (depending on how well-organized you have the diskettes and whether or not any problems such as bad diskettes and/or errors occur). It is much wiser to back up only those items which have changed since your last backup, and to maintain a historical file of previous backups. It would still be wise to back up everything on the hard disk occasionally, perhaps once a month, to help guard against either a diskette in your historical files going bad, or the need to search back through an impossibly large stack of diskettes to accomplish a complete restoration of data and files after experiencing a hardware problem with your hard disk.

It is also wise to practice the backup procedure before you have hard disk troubles. The problems are certain to come at a time when critical tasks are already late and experienced advice is unavailable due to the time of day, weekends, vacations, etc. Do approach a practice backup/restore session with the greatest possible care and caution, since a possible outcome of errors in the procedure is to wind up losing all files and data involved.

In addition to having backup copies of files and programs on diskettes ready to restore to the hard disk, it would also be prudent to have a contingency plan that would allow at least the most critical functions performed by your computer to proceed without the hard disk. If files too large to fit on the diskettes are essential to your operation, your only option may be to have a backup hard disk (or high-capacity diskette drive), or to take the risk of being down for some period of time. One other alternative is to have a *backup site*, which will make available computer time on a system comparable to yours available to tide you over a hardware emergency. If you take this route, be sure to try it before you depend on it. Be aware also that changes in the backup system could render it unable to run your application. For



many systems, however, a “stripped-down” version can be run on diskettes, provided you plan for it in advance as part of your software organization and development effort. This solution is particularly effective with ultrahigh-density floppies.

Most companies that offer add-on hard disks for the Apple do not manufacture the actual hard disk drives. The actual manufacturers tend to produce a generic drive adaptable to various computers and leave the problems of packaging the drives with a controller, software, documentation, cables, box, power supply, etc. to other companies. While this is the general rule, there are exceptions, such as Corvus, which both manufactures and packages its drives for the consumer.

Since the serviceability of a hard disk depends on the entire package of drive, controller, power supply, software, documentation, etc., we have concentrated on reviewing the final package. Many packages use raw drives from as many as half a dozen different drive manufacturers interchangeably, and the list of raw drive suppliers will change from time to time. We have indicated the manufacturers of the underlying raw drives wherever they are available.

## LOCAL AREA NETWORKS

*Local Area Networks* (or LANs) are several computers that share a hard disk, printers, and other peripherals, and can access shared data. For most business users, it is shared access to data that makes networks desirable. A company may well be able to afford a hard disk and printer for every Apple. The problem revolves around having updates, changes, and other up-to-date data available not just to the particular Apple where the data was entered, but also to other Apples in the same office. While it is not impossible to approach this problem by copying files from one machine to another, there are many serious problems with this approach. When several people need to simultaneously update and inquire against the same files, a network is the only realistic solution.

While some businesses will see reducing the number of hard disks and fast or letter-quality printers required for an office as a minor side effect, others (especially home users and schools with multiple computers) will see sharing one hard disk and one printer between several computers as the main advantage of networking. From either perspective, the real question is: which of the several hardware and software systems currently available for networking Apples offers the features and price/performance value that fits my needs best?

The best network will depend as much or more on your specific situation and needs than on the characteristics of the networks. This area is rapidly changing, and there can be no substitute for reading the reviews published in major magazines as new LANs appear and consulting a retailer who supports several networks.

One major feature you will want to especially look for if you plan a small network is whether all Apples can be used for applications work. Many networks require that one Apple be dedicated to running the hard disk. This dedicated Apple (often called a *file server* or *disk server*) cannot be used to run your applications. In these systems, if you need three Apple workstations, you will need four computers, one being tied up as a dedicated disk server. While these systems may provide enough increase in speed on large networks to justify the cost of an extra Apple, in most

small networks the work load on the network is so low that a dedicated disk server would not provide a significant speedup.

Many, possibly all, of the networks have potential problems of incompatibility with some of the expansion cards in use in Apples. There are very few interrupts available for Apple expansion, and manufacturers have used whichever one seemed good to them. The result is that the interrupt used by a network may collide with that used by one or more memory or multifunction cards already installed in the Apples to be networked.

There is no simple way to determine if this conflict exists. Possibly a careful study of the manuals for a prospective network and all of the cards in use would reveal any potential conflicts, but the information as to which interrupt is used is not always easy to find in the card manuals. The only sure test is to try the network on a trial basis or have it selected and installed by a specialist in networking, possibly the retailer for the network.

The cost of a network depends on the network overhead (largely the dedicated disk server where one is required) and the per workstation cost. The features table for each network reflects approximate prices in effect when we reviewed the networks and are meant as a rough guide only. Since prices are subject to rapid change in this fledgling field, checking the latest prices and changed features is the only prudent course.

There are many other factors that should go into the final selection, just as with any hardware acquisition decision. Availability of trained personnel, retailer, and manufacturer location and support, and compatibility with existing hardware and software are among these factors. In any particular case there will certainly be others. We hope this overview of Local Area Networks will give you some perspective on the problems and potential solutions.

---

## **REVIEWS OF HARD DISKS**

### **B-700**

\$2795.00-\$4795.00

Quentin Research, Inc.

TYPE: Fixed hard disk

#### **RATINGS**

- A Overall rating
- C Price/performance
- A Ease of installation
- A Documentation
- A Vendor support

#### **PRODUCT SUMMARY**

The Quentin B-700 features from 5 to 40 megabytes of fixed-media, hard disk, formatted storage in combination with a 25-megabyte streamer-tape backup system.

The Quentin B-700 is a well-built system. We found the installation and opera-

tion of this hard disk drive to be smooth and efficient. The documentation was easy to follow, with step-by-step instructions.

---

## **Corona Starfile**

**\$1500.00**

Corona Data Systems

TYPE: Fixed hard disk

### **RATINGS**

- A Overall rating
- B Price/performance
- A Ease of installation
- A Documentation
- A Vendor support

### **PRODUCT SUMMARY**

The Corona Starfile features 5 megabytes of removable-media, hard-disk, formatted storage. It is easy to install and has good documentation. Corona's products have established an excellent reputation for service and reliability.

The disk requires chassis grounding of the cable when it is installed, a minor although bothersome chore.

---

## **Digital Electric Hard Disk**

**\$1295.00**

Digital Electronic Systems, Inc.

TYPE: Removable hard disk

### **RATINGS**

- A Overall rating
- A Price/performance
- A Ease of installation
- A Documentation
- B Vendor support

### **PRODUCT SUMMARY**

The disk manufactured by Digital Electronic Systems, Inc. features 5 megabytes of removable-media, hard-disk, formatted storage.

The Digital Electric Hard Disk is a well-built system. Installation and operation of this hard disk drive was smooth and efficient. The documentation was easy to follow, with step-by-step instructions.

## **Infax 101A**

**\$1995.00**

Vufax, Inc.

TYPE: Removable hard disk

### **RATINGS**

- A Overall rating
- B Price/performance
- A Ease of installation
- A Documentation
- A Vendor support

### **PRODUCT SUMMARY**

The Infax 101A features 10 megabytes of removable-media, hard-disk, formatted storage. It supports ProDOS, DOS 3.3, Pascal, and CP/M. It comes with a controller card to which up to four drives can be attached. Backup from one 10-megabyte cartridge to another, with two drives, can be done in under 10 minutes. Cartridges can be write protected.

---

## **OMNIDRIVE**

**\$1995.00**

Corvus Systems, Inc.

TYPE: Fixed hard disk

### **RATINGS**

- A Overall rating
- B Price/performance
- A Ease of installation
- A Documentation
- A Vendor support

### **PRODUCT SUMMARY**

The Corvus OMNIDRIVE offers a combination hard disk and OMNINET network service. The disk drive is manufactured by Corvus, a rarity in the hard disk field, which tends toward separate manufacturers and packages. Corvus drives are relatively expensive, with much of the extra cost reflecting the networking features. If you are not definitely planning an OMNINET networked system, it will be hard to justify the prices of the drives, in spite of their excellent performance characteristics. Large Omni drives are available as follows:

11MB—\$2495.00  
16MB—\$3195.00  
45MB—\$4995.00

The Bank, a 200MB freestanding random-access backup unit, is available for \$2195. Cartridges for it are \$70 for 100MB and \$100 for 200MB. All of Corvus' products have excellent service and support reputations. We found their drives easy to install and use. The drives are covered by a 1-year warranty. Provided you plan to expand into an OMNINET system, these are excellent drives.

Considered as drives only, they are not cost competitive with other drives. Note too, that building a network once you have an OMNIDRIVE may still cost as much per workstation as other networks which do not require special drives, provided the other network does not tie up an Apple as a file server. That is the chief value of the OMNIDRIVE—it fills a network role that ties up a complete Apple with hard disk in some other networks.

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## Profile

\$1495.00

Apple Computer, Inc.

TYPE: Fixed hard disk

### RATINGS

- A Overall rating
- B Price/performance
- A Ease of installation
- A Documentation
- A Vendor support

### PRODUCT SUMMARY

The Profile features 5 megabytes of fixed-media, hard-disk, formatted storage. It is the only hard disk manufactured by Apple for the Apple II computers. Special software is available to allow many copy-protected programs to run on the Profile.

As with all Apple products, this system provides reliable service. Installation and operation was smooth and efficient. The documentation is excellent, with easy-to-understand instructions.

---

## Pro Series

\$1399.00-\$1899.00

Micro-Design

TYPE: Fixed hard disk

### RATINGS

- A Overall rating
- B Price/performance
- A Ease of installation
- A Documentation
- A Vendor support

## PRODUCT SUMMARY

The Pro Series features from 10 to 33 megabytes for formatted, fixed hard disk media. It comes with software patches to permit using it with DOS 3.3, Pascal, and CP/M.

The Pro Series is a well-built system. Installation and operation of this hard disk drive was smooth and efficient. The documentation was easy to follow, with step-by-step instructions.

---

### QC10

\$1995.00

Quark

TYPE: Fixed hard disk

### RATINGS

A Overall rating

A Price/performance

A Ease of installation

B Documentation

A Vendor support

## PRODUCT SUMMARY

This QC10, which works with the Apple II, II + , IIe, and IIc (and even the Macintosh) features 10 megabytes of formatted, fixed-media, hard-disk storage. It can handle a number of different operating systems with a different sized portion of the disk for each of the operating system's files. It can even have different portions of the disk reserved for a IIe, IIc, and Macintosh. You set switches on the disk to show which type of machine is using the QC10.

You can have several levels of password protection on the various portions of the disk. Some areas of the disk may not be accessed without a password. Other areas can require a password to write or modify files in that area but not to read files.

The QC10 connects to the external floppy port on the back of the Apple IIc and provides another external floppy port on its back. On an Apple IIe it connects to a DuoDisk or a Disk II controller card. It comes with software for ProDOS, Pascal, Quark's special version of DOS 3.3 and ProDOS, and ALS CP/M (for the IIe only).

---

### Q-500

\$1795.00-\$3795.00

Quentin Research, Inc.

TYPE: Fixed hard disk

### RATINGS

A Overall rating

## **RATINGS**

B Price/performance  
A Ease of installation  
A Documentation  
A Vendor support

## **PRODUCT SUMMARY**

The Quentin Q-500 features from 5 to 40 megabytes of fixed-media, hard-disk, formatted storage.

The Quentin Q-500 is a reliable hard-disk system. The drive was easy to install and operate, partly due to the excellent documentation.

---

## **SQ-5BA**

\$2095.00

Micro-Design

TYPE: Removable hard disk

## **RATINGS**

A Overall rating  
B Price/performance  
A Ease of installation  
A Documentation  
A Vendor support

## **PRODUCT SUMMARY**

The SQ-5BA features 5 megabytes of removable-media, hard-disk, formatted storage. It can be expanded to 25 megabytes. It comes with software patches so it can be used with DOS 3.3, Pascal, and CP/M.

The installation and operation of this hard disk drive was smooth and efficient. The documentation was easy to follow, with step-by-step instructions.

---

## **Trustor Information Modules**

T10—\$1450.00

Datamac

T30—\$2895.00

TYPE: Fixed hard disk

## **RATINGS**

A Overall rating  
A Price/performance  
A Ease of installation  
A Documentation  
B Vendor support

## PRODUCT SUMMARY

The T10 and T30 are fixed hard disks containing 10 megabytes and 30 megabytes of formatted storage media respectively.

These drives functioned reliably and were easy to install. The documentation was easy to follow, with step-by-step instructions.

---

**X5****\$3295.00**

Genie Technologies

TYPE: Removable hard disk

## RATINGS

- A Overall rating
- C Price/performance
- A Ease of installation
- A Documentation
- A Vendor support

## PRODUCT SUMMARY

The X5 features 5 megabytes of removable-media, hard-disk, formatted storage.

Genie Technologies' products are known for their reliability and long life. We found this drive to be easy to install and use.

---

**5MB****\$1995.00**

Genie Technologies

TYPE: Fixed hard disk

## RATINGS

- A Overall rating
- B Price/performance
- A Ease of installation
- A Documentation
- A Vendor support

## PRODUCT SUMMARY

The 5MB features 5 megabytes of fixed-media, hard-disk, formatted storage.

Genie Technologies' products are known for their reliability and long life. We found this drive to be easy to install and use.



**5 + 5**

**\$3995.00**

Genie Technologies

TYPE: Removable hard disk

**RATINGS**

A Overall rating

C Price/performance

A Ease of installation

A Documentation

A Vendor support

**PRODUCT SUMMARY**

The 5 + 5 features 5 megabytes of removable-media, hard-disk, formatted storage and 5 megabytes of fixed-media, hard-disk, formatted storage.

Genie Technologies' products are known for their reliability and long life. We found this drive to be easy to install and use.

---

**REVIEWS OF LOCAL AREA NETWORKS**

**OMNINET**

Corvus Systems, Inc.

**RATINGS**

B Overall rating

B Price/performance

B Ease of installation

B Documentation

B Vendor support

**FEATURES**

Cost per workstation:

3 workstations: \$1900.00

5 workstations: \$1300.00

10 workstations: \$ 900.00

20 workstations: \$ 800.00

Max number workstations: 64

Dedicated file server: N

**PRODUCT SUMMARY**

In the original implementation of OMNINET by Corvus, one Apple had to be dedicated as a file server and was not available for running user programs. In the new version, no dedicated file server is required. If a conventional hard disk attached to an Apple is used as the shared disk, the system is called OmniShare, and the Apple running the shared hard disk can also be used for applications programs.

Still more innovative is the full OMNINET implementation, which relies on intelligent hard disk drives (the Corvus OMNIDRIVE) to function as an independent unit element in the network, with no special relationship to any Apple in the network. Data is transmitted at 1 megabit per second. Up to 64 devices can be in an

OMNINET, and any mixture of these can be freestanding OMNIDRIVES or Apples, or other devices with OMNINET interfaces.

Probably the most unique feature, and one which would be of great value to many users, is OMNINET's ability to interface different types of computers to the network. Currently supported computers are Apple II, *IIfx*, and III, IBM PC and IBM XT, DEC Rainbow 100 and VT-180, Zenith Z100, TI Professional, and Corvus Concept.

Corvus also offers a printer server, which will run three printers; a mirror server, which attaches the Corvus Mirror tape backup system to the network; and the Corvus SNA Gateway, which allows a link between the OMNINET and mainframes or minicomputers using the IBM standard SNA protocol.

---

## PLAN 4000

Nestar

### RATINGS

A Overall rating  
B Price/performance  
B Ease of installation  
B Documentation  
B Vendor support

### FEATURES

Cost per workstation:  
3 workstations: \$7300.00  
5 workstations: \$4500.00  
10 workstations: \$2500.00  
20 workstations: \$1600.00  
Max number workstations: 255  
Dedicated file server: Y

### PRODUCT SUMMARY

PLAN 4000 network uses a dedicated file server made by Nestar and is based on the 68000 microprocessor. It utilizes ARCnet protocol by Datapoint Corp. and has a data transfer rate of 2.5 megabits per second. It supports machines running under Apple DOS, Apple SOS, and CP/M. Currently Corvus OMNINET and EtherSeries are the only other networks which support several makes of computer. The file server acts as a system control unit—handling backups, electronic mail processing, and security access limitations for the computers in the network. A 3270 communications feature is available to link the server to a mainframe.

This system is not dramatically faster than the others for a small number of users, but as the number of workstations increases, it leaves the less expensive systems in the dust. PLAN 4000 is an expensive system, but its ability to run a large number of workstations without great sacrifice in speed will make it the system of choice for some users.

## **WORKSHEET FOR HARD DISKS**

**PRODUCT**

\$ .

**MANUFACTURER**

**TYPE:**

### **RATINGS**

Overall rating  
Price/performance  
Ease of installation  
Documentation  
Vendor support

### **PRODUCT SUMMARY**

---

## **WORKSHEET FOR LOCAL AREA NETWORKS**

**PRODUCT**

**MANUFACTURER**

### **RATINGS**

Overall rating  
Price/performance  
Ease of installation  
Documentation  
Vendor support

### **FEATURES**

Cost per workstation:

3 workstations: \$ .

5 workstations: \$ .

10 workstations: \$ .

20 workstations: \$ .

Max number workstations:

Dedicated file server:

### **PRODUCT SUMMARY**

**Table 13-1. Comparative Ratings for Hard Disk Drives.**

DEVICE	PRICE	RATINGS				
		1	2	3	4	5
B-700	\$2795.00- 4795.00	A	C	A	A	A
Corona Starfile	1500.00	A	B	A	A	A
Digital Electric Hard Disk	1295.00	A	A	A	A	B
Infax 101A	1995.00	A	B	A	A	A
OMNIDRIVE	1995.00	A	B	A	A	A
Profile	1495.00	A	B	A	A	A
Pro Series	1399.00- 1899.00	A	B	A	A	A
QC10	1995.00	A	A	A	B	A
Q-500	1795.00 3795.00	A	B	A	A	A
SQ-5BA	2095.00	A	B	A	A	A
Trustor Information Modules	T10- 1450.00 T30- 2895.00	A	A	A	A	B
X5	3295.00	A	C	A	A	A
5MB	1995.00	A	B	A	A	A
5 + 5	3995.00	A	C	A	A	A
<b>KEY TO RATINGS</b>						
1—Overall rating		4—Documentation				
2—Price/performance		5—Vendor support				
3—Ease of installation						

**Table 13-2. Comparative Ratings for Local Area Networks.**

DEVICE	RATINGS				
	1	2	3	4	5
OMNINET	B	B	B	B	B
PLAN 4000	A	B	B	B	B
<b>KEY TO RATINGS</b>					
1—Overall rating		4—Documentation			
2—Price/performance		5—Vendor support			
3—Ease of installation					

**Table 13-3. Comparative Features for Local Area Networks.**

DEVICE	FEATURES					
	1	2	3	4	5	6
OMNINET	1900.00	1300.00	900.00	800.00	64	N
PLAN 4000	7300.00	4500.00	2500.00	1600.00	255	Y
KEY TO FEATURES						
1—Cost per workstation (3)			4—Cost per workstation (20)			
2—Cost per workstation (5)			5—Maximum number of workstations			
3—Cost per workstation (10)			6—Dedicated file server			

# Chapter 14



## RAM Cards

A *RAM card* is a plug-in card for the Apple II, II+, or IIe (but not the Apple IIc) which contains 16K or more RAM. The memory is not directly addressable by the 6502 or 65C02 microprocessor. It requires a special technique to permit data or programs to be stored and retrieved from RAM. Consequently, the card either contains the necessary support programs in firmware or on a disk supplied with the card.

A RAM card can be used in one of two ways. It can be additional RAM memory in which the computer can store part or all of a program or the data being used by the program. Thus, with a 64K Apple and the use of a 128K RAM card, you can have the equivalent of a 192K Apple. The RAM memory on the card can also function as a RAM disk. The card would then not be considered as part of the expanded memory of the computer, but as a disk drive. The programs and data are stored on the card. In order to be used by the computer, they must first be read back into main memory. The difference between a RAM disk and a regular disk is that a RAM disk is between 3 and 10 times faster in transferring data.

RAM only maintains the data in it as long as electrical power is applied to the chips. A RAM card must, therefore have some source of power to keep the memory active. If you have a lot of other peripherals attached to your Apple and the RAM card gets its power from the Apple bus, the additional power demand of the RAM card can significantly strain the power supply of your Apple. Some RAM cards, however, have a separate power supply, which considerably alleviates this problem.

The other effect of the need of RAM chips for electrical power in order to maintain its memory is that any program or data stored in the RAM disk is lost if power

is lost. Some RAM cards provide a backup battery, which will maintain the power to the card for several hours. This method permits saving the contents of the RAM disk to a more permanent floppy disk in the event of a power failure.

---

## Axlon RAMdisk

Axlon

128K—\$379.00

320K—\$695.00

### RATINGS

B Overall rating  
 B Price/performance  
 B Software compatibility  
 A Ease of installation  
 A Documentation  
 A Vendor support

### FEATURES

Needs jumper:	N
CP/M compatible:	+
Pascal compatible:	+
RAM disk:	+
Memory expansion:	+
Battery backup:	+
Separate power supply:	+

### PRODUCT SUMMARY

The Axlon RAMdisk comes in two forms. 128K version consists of a fairly standard-looking, plug-in card with a number of RAM chips on it. The 320K version looks like a disk controller card and a drive unit without a slot in which to put the disk.

The 128K card emulates a single disk drive, except the “disk” has only 32 tracks instead of the normal 35. In DOS 3.3 this form works out well since most DOS 3.3 disks have 3 tracks holding the DOS image. Since you will be booting from a normal disk drive, the loss of the DOS image is not a problem. The same is generally true of CP/M disks, which contain either the CP/M system or nothing on the first three tracks.

In the case of ProDOS or Pascal disks, however, the 128K RAMdisk will not hold a full disk of information. Still, the ability to get the 300 to 1000 percent disk I/O speedup is worth giving up this small amount of space.

The RAMdisk 320, on the other hand, emulates not only two full disk drives, but will allow storage of up to 40 “tracks” per disk. This is a 1/7 space improvement over the standard Apple disk drive. In normal configuration, the RAMdisk 320 only has 35 “tracks.”

RAMdisk 320 comes with its own power supply so it doesn’t place an added stress on the Apple power supply. The power supply also supplies a trickle charge to the built-in, rechargeable batteries which provide backup power for up to 3 hours. The backup power is particularly useful if you should have a great deal of material on the RAMdisk, and the power goes off. You can boot from the RAMdisk 320, provided there is a program and operating system image on it.

The RAMdisk comes with several sample programs. The Mini Base Phone Book stores up to 200 records of six fields each. The Directory allows creation, modification, storage, and retrieval of over 3200 records. These large, disk-based data file programs amply illustrate the speed advantage of the RAMdisk.

Hardware also comes with a utility which permits quick copying of data from a standard disk to the RAMdisk and from the RAMdisk back to the standard disk. Of course, the RAMdisk will only work with software which is not copy protected. The RAMdisk works on the Apple II, II+, and IIe.

---

## Legend RAMcard

64K—\$327.00

Legend Industries, Ltd.

128K—\$590.00

### RATINGS

B Overall rating  
 B Price/performance  
 B Software compatibility  
 B Ease of installation  
 A Documentation  
 A Vendor support

### FEATURES

Needs jumper:	Y
CP/M compatible:	+
Pascal compatible:	+
RAM disk:	+
Memory expansion:	+
Battery backup:	-
Separate power supply:	-

### PRODUCT SUMMARY

The Legend RAMcard comes in two versions. One, made for the Apple II and II+, requires the use of a special jumper from the card to one of the RAM chip slots on the Apple motherboard. Installation is not difficult, although it does require pulling a chip off the motherboard. The Apple IIe version of the card does not require a jumper.

The card comes with disk emulation software which works in DOS, ProDOS, CP/M, and Pascal. In addition it comes with VC Plus, a program which displays VisiCalc in either 40 or 80 columns and allows full use of the increased memory of the RAMcard. With a 128K card, you can have a VisiCalc template of up to 176K. Full documentation, including extensive program listings, is included with the card.

---

## Synetix Flashcard

147K—\$349.00

Synetix, Inc.

294K—\$529.00

### RATINGS

B Overall rating  
 B Price/performance  
 B Software compatibility  
 A Ease of installation  
 B Documentation  
 B Vendor support

### FEATURES

Needs jumper:	N
CP/M compatible:	+
Pascal compatible:	+
RAM disk:	+
Memory expansion:	-
Battery backup:	-
Separate power supply:	-

### PRODUCT SUMMARY

Flashcard is a RAM disk card which provides the equivalent of either one or



two full disk drives. An Apple disk normally will hold 140K. This storage can be some combination of data, programs, operating system, and disk directory. The Flashcard can hold sufficient material for a full disk, as well as an extra 7K of RAM for its own housekeeping matters.

The card comes with three disks containing patches to allow DOS 3.3, CP/M, and Pascal to use the RAM disk. A speed increase of 100 to 500 percent is claimed for disk input and output.

The Flashcard fits into a slot in the Apple motherboard and contains a number of 64K RAM chips. If you get the 147K version, you can upgrade it to a 294K version just by plugging in additional 64K RAM chips.

---

## Titan RAMcards

Titan Technologies

32K—\$219.00

64K—\$349.00

128K—\$499.00

64K upgrade—\$150.00

### RATINGS

B Overall rating  
B Price/performance  
B Software compatibility  
A Ease of installation  
B Documentation  
A Vendor support

### FEATURES

Needs jumper:	N
CP/M compatible:	+
Pascal compatible:	+
RAM disk:	+
Memory expansion:	+
Battery backup:	-
Separate power supply:	-

### PRODUCT SUMMARY

Titan RAMcards come in three sizes: a nonexpandable 32K version, an expandable 64K version, and a nonexpandable 128K version. The cards plug into any slot on an Apple II, II+, or IIe (except the auxiliary slot on the IIe).

Three programs come with the card. MoveDOS, which works with DOS 3.3 only, moves the operating system up to the highest memory locations on the RAMcard, freeing up some 10K of RAM for your programs or data. RAM Expand, again for DOS 3.3 only, gives you a larger memory machine up to capacity of the RAMcard. Pseudo Disk allows the use of as much of the RAM card as is available as a super-fast disk. You must copy data or programs from a standard disk to the RAM disk. The program only works with software which is not copy protected.

A special program is available to expand the available memory while using VisiCalc. VC-Expand costs \$69.00 in the standard version. A version to allow the use of 80-column cards with VisiCalc on an Apple II and II+ costs \$89.00.

## WORKSHEET FOR RAM CARDS

### PRODUCT

\$ .

### MANUFACTURER

### RATINGS

Overall rating  
Price/performance  
Software compatibility  
Ease of installation  
Documentation  
Vendor support

### FEATURES

Needs jumper:  
CP/M compatible:  
Pascal compatible:  
RAM disk:  
Memory expansion:  
Battery backup:  
Separate power  
supply:

### PRODUCT SUMMARY

Table 14-1. Comparative Ratings for RAM Cards.

DEVICE		PRICE	RATINGS					
			1	2	3	4	5	6
Axlon RAMdisk	128K —	\$ 379.00	B	B	B	A	A	A
	320K —	695.00	B	B	B	A	A	A
Legend RAMcard	64K —	327.00	B	B	B	A	A	A
	128K —	529.00	B	B	B	B	A	A
Synetix Flashcard	147K —	349.00	B	B	B	A	B	B
	294K —	529.00	B	B	B	A	B	B
Titan RAMcard	32K —	219.00	B	B	B	A	B	A
	64K —	349.00	B	B	B	A	B	A
	128K —	499.00	B	B	B	A	B	A
KEY TO TABLE 14-1—RATINGS 1—Overall rating 2—Price/performance 3—Software compatibility 4—Ease of installation 5—Documentation 6—Vendor support								

**Table 14-2. Comparative  
Features for RAM Cards.**

DEVICE	FEATURES					
	1	2	3	4	5	6
Axlon RAMdisk	N	+	+	+	+	+
Legend RAMcard	Y	+	+	+	-	-
Synetix Flashcard	N	+	+	-	-	-
Titan RAMcard	N	+	+	+	-	-
<b>KEY TO FEATURES</b>						
1—Needs jumper			5—Memory expansion			
2—CP/M compatible			6—Battery backup			
3—Pascal compatible			7—Separate power supply			
4—RAM disk						

# Chapter 15



## Clocks

A clock, also called a *real time clock*, is a plug-in card which gives your Apple the ability to tell time. The clock card not only keeps track of the time, but does other activities related to time. Indeed, you can even write a program which will flash a message on the screen at a specific time, turning your computer into an expensive alarm clock.

Clock cards traditionally have electronic signals on them which keep track of the year, month, date, day of the week, hour, minute, and second. It is set by you when it is installed in the computer. Clock cards have two sources of power. They use the power from the Apple computer, transmitted through the slot in which it is plugged, and they use a rechargeable battery to keep the clock running when you turn off the power to the computer. The clock card also uses the power of the Apple to recharge its battery.

Using a clock card from Applesoft usually consists of activating the card (by an `IN# <slot>` command), and then placing the correct time into a string variable. A variety of different formats have been devised over the years for the time, and the better clocks usually generate the time in several formats.

Clocks serve many functions. One of the more useful is stamping a disk file with the time and date—storing in the directory the time and date the file was saved. This is particularly helpful when you have several different versions of the file on several disks and wish to know which is the most current version. Apple's newest operating system, ProDOS, supports time and date stamping of files. In the p-System, the date is saved with the file name according to the date set in the system filer.

Most clock cards come with software which automatically sets the current date from the clock upon booting of the p-System.

CP/M 2.2 and DOS 3.3 can both be modified to save the time and date along with the filename. Most clock cards also provide this software either on disk or in the documentation.

Another use of clock cards is in calendaring programs. This application usually requires software which recognizes the particular clock card, meaning it expects to find the date in a particular format. Obviously the more formats your clock card can emulate, the greater likelihood you can use a particular calendaring program.

Another use of clock cards is timing intervals. Using this function involves reading a particular time or setting the timer to zero, carrying out a function, and then reading the time again. The period between the two times can then be displayed, often even in milliseconds (one thousands of a second).

The final major function of a clock card is the ability to interrupt an existing program at a variety of times, returning control to the existing program after taking care of the interrupt. For example, if the clock interrupts the running program once every second, it can display the time with an update every second, while letting the existing program continue running with almost no noticeable effect.

---

## ProClock

\$159.00

### Practical Peripherals

#### RATINGS

B Overall rating  
 B Price/performance  
 B Software compatibility  
 A Ease of installation  
 B Documentation  
 A Vendor support

#### FEATURES

Year, month, date:	+
Day of the week:	+
Hour (12 or 24 hour):	+
Millisecond:	-
Battery life:	10 years
# of time formats:	8
# of interrupts:	4
Works with:	
II, II+, IIe:	+
ProDOS:	+
DOS 3.3:	+
Pascal:	+
CP/M:	+

### PRODUCT SUMMARY

The ProClock (Fig. 15-1) emulates three other clocks made for the Apple II family: the Appletclock (a nonProDOS-compatible clock which formerly was the standard for Apple clocks), the Superclock II (manufactured by West Side Electronics and which as been superseded by the ProClock), and the Thunderclock. It is fully Pro-DOS com-



Fig. 15-1. The ProClock is a full-featured clock card for the Apple II, II+, and IIe (courtesy of Practical Peripherals).

patible and will automatically time and date stamp the ProDOS files. It also comes with a utilities disk in BASIC and Pascal, supporting calls to the clock from those languages, automatic setting of the date in Pascal, and date and time stamping of files in DOS 3.3. The clock is compatible with CP/M 2.2 and 3.0 (CP/M Plus).

The software-controlled interrupts occur on the millisecond, second, minute, or hour. The clock can be write protected so that its current time setting is not inadvertently reset by some program.

The clock comes with a 5-year warranty.

---

## Thunderclock

\$150.00

Thunderware, Inc.

### RATINGS

- B Overall rating
- C Price/performance
- A Software compatibility
- A Ease of installation
- B Documentation
- B Vendor support

### FEATURES

- Year, month, date: +
- Day of the week: +
- Hour (12 or 24 hour): -
- Millisecond: - (interval timing only)
- Battery life: 4 years
- # of time formats: 7

## FEATURES

# of interrupts:	3
Works with:	
II, II+, IIe:	+
ProDOS:	+
DOS 3.3:	+
Pascal:	+
CP/M:	+

## PRODUCT SUMMARY

The Thunderclock is automatically recognized by ProDOS and will date and time stamp your files under ProDOS without the need for any special programming. It is the clock which is mentioned by name in the ProDOS manual. The clock can also be used with other operating systems. It will update the Pascal date automatically on bootup with the optional Pascal disk (\$29.00). It will support time and date stamping of DOS 3.3 files with the optional DOS Dater disk (\$29.00). The CP/M disk permits calls to the clock from MBASIC or GBASIC in CP/M 2.2 but not CP/M 3.0 (\$29.00).

Installation is very easy. You turn off your Apple and insert the clock in any slot except 0 in the Apple II and II+ or 3 in the Apple IIe. The standard slot for a clock is 4.

The Time Utility software which comes with the clock adds 13 new time commands to Applesoft running under ProDOS. This feature permits the calling of various time functions without the need for special machine-language calls or input statements. The clock permits interrupts at 64, 256, or 2048 per second.

An optional BSR X-10 interface is available for \$49.00. There is a 1-year warranty applicable to the Thunderclock.

---

## Timemaster II H.O.

\$129.00

Applied Engineering

## RATINGS

- B Overall rating
- A Price/performance
- A Software compatibility
- A Ease of installation
- C Documentation
- A Vendor support

## FEATURES

Year, month, date:	+
Day of the week:	+
Hour (12 or 24 hour):	+
Millisecond:	+
Battery life:	10 years
# of time formats:	7
# of interrupts:	8
Works with:	
II, II+, IIe:	+
ProDOS:	+
DOS 3.3:	+

## RATINGS

## FEATURES

Pascal:	+
CP/M:	+

## PRODUCT SUMMARY

The Timemaster II H.O. is the chameleon of the Apple II family clocks. It will emulate a number of other clocks, including the Thunderclock and the Proclock, as well as earlier models of clocks which are not compatible with ProDOS. This feature permits you to run a variety of software which uses many different clocks. The clock will correctly emulate most clocks without user intervention. It will also respond to software commands to emulate the other clock.

The Timemaster displays many different types of time formats, including milliseconds. It is the only ProDOS-compatible clock which displays milliseconds.

The clock comes with two disks of software showing sample applications, including machine-language programs with source code, a DOS 3.3 file date/time stamper, Pascal date setter, and CP/M calls. It can do interval timing from a millisecond to 48 days and correctly recognizes leap years.

There is an optional BSR X-10 interface (\$49.00), which takes advantage of the built-in BSR firmware on the clock card. The clock is covered by a 3-year warranty.

---

## WORKSHEET FOR CLOCKS

## PRODUCT

\$ .

## MANUFACTURER

## RATINGS

Overall rating  
Price/performance  
Software compatibility  
Ease of installation  
Documentation  
Vendor support

## FEATURES

Year, month, date:  
Day of the week:  
Hour (12 or 24 hour):  
Millisecond:  
Battery life:  
# of time formats:  
# of interrupts:  
Works with:  
II, II+, IIe:  
ProDOS:  
DOS 3.3:  
Pascal:  
CP/M:



## PRODUCT SUMMARY

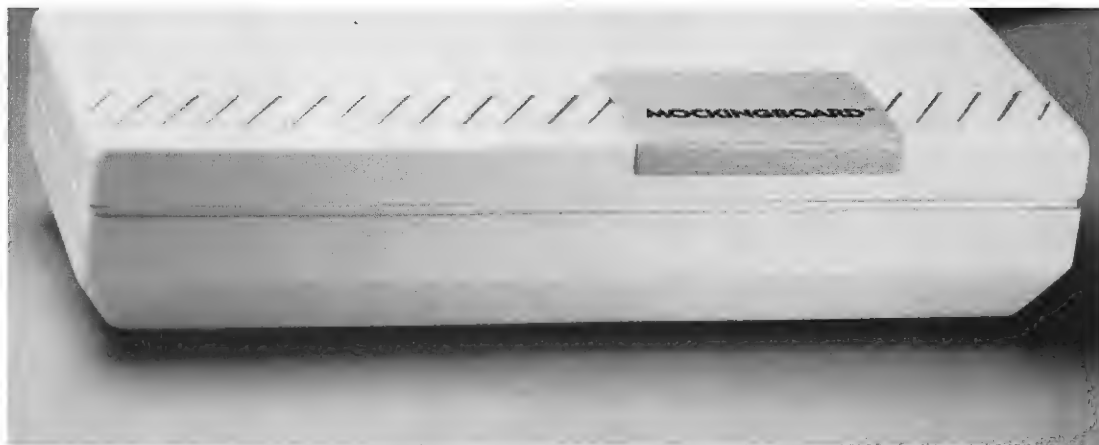
Table 15-1. Comparative Ratings for Clocks.

DEVICE	PRICE	RATINGS					
		1	2	3	4	5	6
ProClock	\$ 159.00	B	B	B	A	B	A
Thunderclock	150.00	B	C	A	A	B	B
Timemaster II H.O.	129.00	B	A	A	A	C	A
<b>KEY TO RATINGS</b> 1—Overall rating      4—Ease of installation 2—Price/performance    5—Documentation 3—Software compatibility   6—Vendor support							

Table 15-2. Comparative Features for Clocks.

DEVICE	FEATURES											
	1	2	3	4	5	6	7	8	9	10	11	12
ProClock	+	+	+	-	10	8	4	+	+	+	+	+
Thunderclock	+	+	-	-	4	7	3	+	+	+	+	+
Timemaster II H.O.	+	+	+	+	10	7	8	+	+	+	+	+
<b>KEY TO FEATURES</b> 1—Year, month, date      7—# of interrupts 2—Day of the week      8—Works with II, II+, IIe 3—Hour                      9—Works with ProDOS 4—Millisecond              10—Works with DOS 3.3 5—Battery life              11—Works with Pascal 6—# of time formats      12—Works with CP/M												

# Chapter 16



## Sound Cards

All Apple II computers come with a built-in speaker, typically a .1-watt, 8-ohm speaker about 1 1/2 inches in diameter. This is hardly the type of speaker which is designed for high-quality sound production, although it does put out a credible tone. The speaker circuitry has been enhanced somewhat on the Apple IIc. It uses the same speaker as the other Apple II computers, but it has a volume control and an auxiliary earphone jack.

Ever since the beginning of the Apple II family, various software programs have been available which make use of the speaker for a variety of uses such as sound effects, music, and speech. They have, however, all suffered from the deficiencies of the built-in Apple speaker and from its inability to normally transmit more than one voice and channel.

The sound cards for the Apple II provide an alternative sound output device for production of voice, music, and sound effects. Some of these cards provide an amplified stereophonic output which is connected to two standard 8-ohm speakers. Other cards provide an unamplified signal which is connected to the input of a standard stereophonic amplifier and routed to the speakers through the amplifier.

Sound cards provide three basic types of sounds. Music output provides a variety of tones, ranging over a number of octaves and multiple voices or tones at a single time. The music can be produced in several different voices, a term which describes how the tone rises and falls within its particular time period.

Voice output, also called voice or speech *synthesis*, produces an output that, in most instances, seems very mechanical or robot-like. A variety of voice found much less often is the more human-sounding voice which requires substantially more hard-

ware and software and is considerably less versatile. It is, however, considerably more natural sounding.

Speech cards use a variety of methods to produce speech output. Almost all of them use *phonemes*, letter combinations which produce a particular, discrete sound. The relationship between phonemes and actual written English is not direct and sometimes is quite bizarre. Most speech synthesizers, therefore, also have a form of speaking standard written text using a text-to-speech algorithm, which is usually a series of rules, numbering over 50, for translating English letter combinations into phonemes. Depending on the sophistication of the algorithm, the results of the translation can be quite close to the written English or quite far removed.

The third type of sound produced is called *sound effects*. By varying the output, you can produce such noises as a train passing or a thunderstorm, as well as the sounds of many different arcade-type games.

---

## Cricket

\$179.95

Street Electronics Corporation

### RATINGS

B Overall rating  
B Price/performance  
B Software compatibility  
A Ease of installation  
B Documentation  
A Vendor support

### FEATURES

No. of voices:	6
Stereo:	+
Voice:	+
Text to speech:	+
Amplifier:	+
Speakers:	+
Sound effects:	+

### PRODUCT SUMMARY

The Cricket is a music, speech, sound, and clock peripheral designed for the Apple IIc. It plugs into the modem port at the back of the IIc and functions in much the same manner as an Echo+ card with an added clock function.

It features a natural (female) voice with a 700-word vocabulary and an unlimited "normal" (or robotic) type voice. The Cricket supports stereo music and sound effects.

Words can be spoken at either a regular or a fast rate of speaking. The speech synthesizer uses a text-to-speech algorithm to translate written English to spoken words. Commands also control pitch and volume levels.

A disk of software includes a built-in sound library. The music capabilities are compatible with the Mountain Music System. There is also a Pascal disk, which supports music and sound capabilities from Pascal.

The device has a speaker with a volume control and a mini-stereo headphone jack. The clock function supports time and data stamping of disk files under PRODOS.

## Echo +

\$149.95

Street Electronics Corp.

### RATINGS

B Overall rating  
A Price/performance  
B Software compatibility  
A Ease of installation  
B Documentation  
A Vendor support

### FEATURES

No. of voices:	6
Stereo:	+
Voice:	+
Text to speech:	+
Amplifier:	+
Speakers:	+
Sound effects:	+

### PRODUCT SUMMARY

The Echo + is an upgraded version of what was formerly a speech-only card. It features a natural (female) voice with a 700-word vocabulary and an unlimited "normal" (or robotic) type voice. The card supports stereo music and sound effects. It installs into any slot in an Apple II, II +, or IIe.

Words can be "spoken" at either a regular or fast rate. The speech synthesizer uses a text-to-speech algorithm to translate written English to spoken words. Commands to the card also control pitch and volume levels.

A disk of software includes a built-in sound library. The music capabilities are compatible with the Mountain Music System. There is also a Pascal disk which supports music and sound capabilities from Pascal.

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## MC1

\$169.00

ALF Products Inc.

### RATINGS

B Overall rating  
A Price/performance  
B Software compatibility  
A Ease of installation  
A Documentation  
B Vendor support

### FEATURES

No. of voices:	9
Stereo:	+
Voice:	-
Text to speech:	-
Amplifier:	-
Speakers:	-
Sound effects:	+

### PRODUCT SUMMARY

The MC1 fits into any slot on the Apple II, II +, or IIe. It has nine voices: three play through the left output, three through the right output, and three through both. The three "middle" voices can produce either notes or white noise. The range for the music notes is 6 octave levels and 16 volume levels. The volume range is 28 decibels.

The card comes with song entry software which requires game paddles on the Apple II and II+ and uses the arrow and Apple keys on the Apple IIe. Whole notes through 64th notes can be entered, as well as triplet, dotted, and tied notes. The playback tempo is adjustable.

During playback the screen displays a moving display with a bouncing square which changes color depending on the volume. It does not display sheet music symbols during playback, although it does so during note entry.

Additional software supplied with the program includes a playback utility, which permits you to specify a group of songs (an "album") to be played back. The disk also includes six sample songs.

Over 5,000 bytes of memory are available for music storage using the compose software. A sample program which uses about 700 bytes of storage runs over 3 minutes.

Installation consists of plugging the card into an available slot and connecting a supplied 4-foot cable between the card and your stereo amplifier. Optional software includes two disks of songs (\$69.95 each) and an Ear Training program (\$49.95).

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## MC16

First card—\$179.00

ALF Products Inc.

Extra cards—\$125.00

### RATINGS

B Overall rating  
 B Price/performance  
 B Software compatibility  
 A Ease of installation  
 A Documentation  
 B Vendor support

### FEATURES

No. of voices:	3
Stereo:	—
Voice:	—
Text to speech:	—
Amplifier:	—
Speakers:	—
Sound effects:	—

### PRODUCT SUMMARY

The MC16 fits into any slot on the Apple II, II+, or IIe. It has three monophonic voices which produce music notes. The ranges for the notes are 8 octave levels and 256 volume levels. The volume range is 78 decibels. For stereo music you use two separate cards. The tone accuracy of the MC16 is significantly greater than that of the MC1.

The card comes with song entry software which requires game paddles on the Apple II and II+ and uses the arrow and Apple keys on the Apple IIe. Whole notes through 64th notes can be entered, as well as triplet, dotted, and tied notes. The playback tempo is adjustable.

During playback the screen displays a moving display with a bouncing square, which changes color depending on the volume. It does not display sheet music symbols during playback, although it does so during note entry.

Additional software supplied with the program includes a playback utility, which

permits you to specify a group of songs (an "album") to be played back. The disk also includes six sample songs.

Over 5,000 bytes of memory are available for music storage using the compose software. A sample program which uses about 700 bytes of storage runs over 3 minutes.

Installation consists of plugging the card into an available slot and connecting a supplied 4-foot cable between each card and your stereo amplifier. Optional software includes two disks of songs (\$69.95 each).

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## Mockingboard

\$99.00/179.00/195.00

Sweet Micro Systems

### RATINGS

B Overall rating  
B Price/performance  
B Software compatibility  
A Ease of installation  
B Documentation  
B Vendor support

### FEATURES

No. of voices:	6
Stereo:	+
Voice: (optional)	+
Text to speech:	-
Amplifier:	+
Speakers:	-
Sound effects:	+

### PRODUCT SUMMARY

The Mockingboard comes in three versions. The initial card comes with built-in sound effects and music capabilities. An add-on set of chips give the card speech capabilities. These two versions fit in any slot of an Apple II, II+, or IIe. The third version, the Mockingboard IIc (or Mockingboard D) is designed for the Apple IIc (Fig. 16-1).

There are six voices for the Mockingboard. Three voices for each of two channels are available for music and sound effects. The card comes with a demonstration disk, which includes a sound utility, music demo, and library of sounds.

The output from the card can be connected directly to your own speakers. No external amplifier is needed because the card has two built-in, 1/2 watt amplifiers. The output is designed for standard 8-ohm speakers. Volume is controlled by thumb-wheel potentiometers on the card.

The sound chips can have tone periods, noise periods, and sound envelope shape and period set. Ten different envelope shapes are available. Eight octaves of music are available.

The IIc version of the Mockingboard also has built-in stereo speakers. It is designed to coordinate with the Apple IIc.



Fig. 16-1. The Mockingboard D is made especially for the Apple IIc (courtesy of Sweet Micro Systems).

## Super Music Synthesizer

\$159.00

Applied Engineering

### RATINGS

B Overall rating  
A Price/performance  
B Software compatibility  
A Ease of installation  
C Documentation  
A Vendor support

### FEATURES

No. of voices:	16
Stereo:	+
Voice:	-
Text to speech:	-
Amplifier:	-
Speakers:	-
Sound effects:	+

### PRODUCT SUMMARY

The Super Music Synthesizer works in an Apple II, II+, or IIe. It requires at least 48K of memory and a disk drive. The card fits into any slot, although slot three is recommended.

The 16 voices on the card give it true stereo and discrete quadraphonic music capabilities. Some 30 songs are included on a double-sided disk, and you can compose your own. The card will also play songs written for the ALF music card, although it will do so in the 9 voices the ALF card has.

The compose software uses the game paddles as an input device. Note lengths vary from whole through 64th notes. Dotted, triplet, and tied notes are supported. The 16 voices can be configured as 12 simultaneous tones with 4 percussion sounds. Tones range from two octaves below middle C to two octaves above middle C.

The card has three tone oscillators and one noise oscillator, each divided into four separate outputs. The sound effects capabilities of the card can be programmable from BASIC.

The output of the card is directed to your stereo through cables plugged into RCA audio output jacks. The card is covered by a 3-year warranty.

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## WORKSHEET FOR SOUND CARDS

**PRODUCT**

\$ .

**MANUFACTURER**

### RATINGS

Overall rating  
Price/performance  
Software compatibility  
Ease of installation  
Documentation  
Vendor Support

### FEATURES

# of voices:  
Stereo:  
Voice:  
Text to speech:  
Amplifier:  
Speakers:  
Sound effects:

## PRODUCT SUMMARY

Table 16-1. Comparative Ratings for Sound Cards.

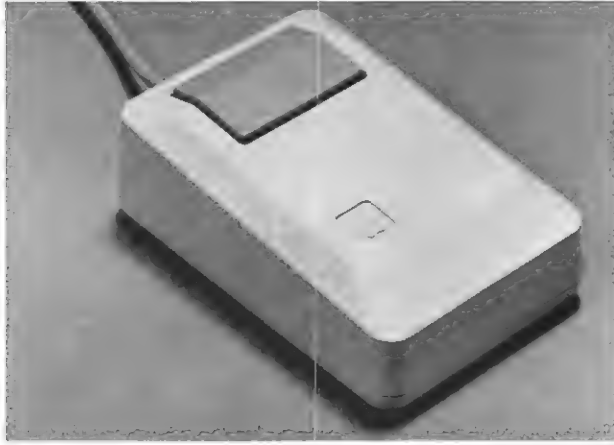
DEVICE	PRICE	RATINGS					
		1	2	3	4	5	6
Cricket	\$ 179.95	B	B	B	A	B	A
Echo +	149.95	B	A	B	A	B	A
MC1	169.00	B	A	B	A	A	B
MC16	179.00	B	B	B	A	A	B
Mockingboard	99.00	B	B	B	A	B	B
	179.00	B	B	B	A	B	B
	195.00	B	B	B	A	B	B
Super Music Synthesizer	159.00	B	A	B	A	C	A
<b>KEY TO RATINGS</b>							
1—Overall rating		4—Ease of installation					
2—Price/performance		5—Documentation					
3—Software compatibility		6—Vendor support					



**Table 16-2. Comparative Features for Sound Cards.**

DEVICE	FEATURES						
	1	2	3	4	5	6	7
Cricket	6	+	+	+	+	+	+
Echo +	6	+	+	+	+	+	+
MC1	9	+	-	-	-	-	+
MC16	3	-	-	-	-	-	-
Mockingboard	6	+	+	+	+	-	+
Super Music Synthesizer	16	+	-	-	-	-	+
<b>KEY TO FEATURES</b>							
1—Voice of voices				5—Amplifier			
2—Stereo				6—Speakers			
3—Voice				7—Sound effects			
4—Text to speech							

# Chapter 17



## Pointing Devices

Pointing devices are used to select items displayed on a screen or to move the cursor around on a screen. They come in a variety of forms, from the built-in arrow keys on the Apple keyboard through joysticks and touch tables, to light pens and mice.

### GAME CONTROLLERS

Game controllers get their name from the fact that they are plugged into the Apple game input/output plug or port and because they are often used to make moves in various games. Game controllers come in several forms.

Paddles, which consist of a single potentiometer (variable resistor) plus a single button, are usually sold in pairs. There are four paddle and three button input lines in the Apple II, II+, and IIe. There are two paddle and two button input lines in the Apple IIc. These inputs return a value between 0 and 255, which can be peeked at from Applesoft or read by a machine language program. The buttons return a value of either on (pressed) or off (not pressed).

Joysticks consist of the equivalent of two paddle inputs hooked together. The up/down movement of the joystick is read as one paddle value, and the left/right movement is read as a second one. Most joysticks have two push buttons.

Trackballs are a form of joystick which use a rolling ball, as opposed to a stick to make the movement.

## LIGHT PENS

Using a light pen with your computer is like using a pen and pad. Pass the light pen across the screen, and a line appears on the screen. You can draw circles, boxes, and other shapes by simply pointing the light pen at the screen. You can even make detailed drawings, using a light pen like a paint brush. Light pens do not just have a useful purpose in graphics applications, however. You can make a selection from a screen menu by touching the light pen to your choice. You can manipulate text or other data on the screen with a light pen. Educational software that makes use of a light pen can be especially appealing to children. Many children can learn to use a light pen before they are able to use the keyboard. Some types of games are well adapted to light pen technology. The possible practical uses for a light pen are endless.

Light pens are light-sensing devices that look very similar to an ordinary pen. One end has a cord which plugs into an interface port on the Apple. The other end generally has a small glass lens.

Light pen functions are based on the principles which govern how a monitor works. The surface of the screen is actually the end of a cathode ray tube. Inside the tube, a beam of electrons are aimed at the screen's phosphor-coated inner surface. A point (or pixel) on the screen is illuminated when the beam strikes it. As the beam moves across the screen from left to right and top to bottom, the points light up momentarily to create an image. The point continues to glow for a moment after the beam has passed. Since the beam can not strike more than one point at a time, only one point at a time is illuminated. The beam moves so quickly, however (the screen is scanned approximately 60 times each second), that all the points on the image appear to glow together.

A light pen responds to light entering its tiny lens. If you point the light pen at the screen, it can sense an illuminated pixel. It then communicates the horizontal and vertical locations of the pixel to the computer. The program interfacing with the light pen uses this information to perform a function such as drawing a line or implementing a menu selection.

There are two types of light pen mechanisms: the push tip style and the touch ring style. The *push tip* version has a depressible, hollow tip protruding about 1/4 inch out of the end of the pen (it looks like a thick ball point pen tip). This tip is placed on the screen surface for positioning. To activate the pen, simply press the tip against the screen. The push tip pen always requires contact with the screen surface to work. The *touch ring* style does not need to touch the screen at all. This type of pen has a metal ring around it, located about an inch from the tip. A metal prong is positioned over and slightly above the ring (think of a ball point pen with a sprung clip). This pen is put close to the surface of the screen, aimed at a point on the screen, and activated by pressing the metal clip against the ring.

The accuracy of a light pen is determined by a number of factors. The type and brightness of a monitor may affect how well a light pen works. You may be able to achieve results using a good-quality monitor that you cannot with a television or poor-quality monitor. An overly sensitive light pen may respond to light from neighboring pixels, especially if you are working in high-resolution mode. Also, er-

rors may occur if the monitor exhibits some interference or noise. If the image jiggles a little, the light pen may be accidentally triggered.

Another factor affecting light pen accuracy is the phosphor persistence of the CRT. A pixel's glow begins to decay as soon as the electron beam is no longer striking it. If the pixel continues to glow (indicating a long persistence), the light pen may have difficulty registering accurately.

Finally, the human element may cause problems when using a light pen. Practice may be needed to learn to accurately aim the light pen at the screen to achieve the desired results.

Light pens for the Apple often include software designed for specific application. A major consideration in selecting a light pen may be the type and quality of the software that accompanies it.

The type of application you wish to use the light pen with should be considered when you are looking at the quality of the pen. A high-resolution graphics application requires a light pen of high quality, as well as a good monitor. For menu selection, text manipulation, or games, the accuracy and resolution capabilities of the pen are not as critical.

## **TOUCH TABLETS**

A tablet allows you to produce graphic images by sketching on the tablet with a stylus or your finger. With the proper software, whatever you sketch on the surface of the tablet will appear on the display screen. Most touch tablets plug into the game I/O port or socket.

## **MOUSE**

A *mouse* is a small, palm-sized "box on wheels" that moves across a flat surface and controls the movement of the cursor. Usually, the mouse is placed on the desktop to the right or left of the computer and moved around as desired. Buttons on the top of the mouse are used to select functions depending on the number of times or the order in which they are pressed. Cursor movement and other functions can be performed considerably faster with the mouse than with the traditional cursor movement keys.

The first mouse was developed in the early 1960s by Douglas Englebart, while working at Stanford Research Institute on a project to find interactive computer aids. It was described as a small mouse-like object with buttons "sticking up on top like ears." The wheels mounted underneath measured movement along the X- and Y-axes which was then converted into the movement of the cursor on the screen. Englebart and his associates used the mouse successfully at the Institute for a number of years.

The mouse was largely ignored for many years, being considered a gimmick by many people. Only lately have people realized that the mouse can significantly enhance the speed and accuracy of many tasks involving a computer. In several comparison tests, the mouse scored high in word processing use against the light pen, joystick, conventional keypad, and digitizing tablets. They also were less fatiguing

to use than the new "touchscreen," because the user's arm did not have to be held up high.

There are two main types of "mice:" mechanical and optical. The *mechanical mouse*, which is the older of the two technologies, works by counting the revolutions of a shaft attached to the wheels or ball in the base of the mouse. This counting can be done electrically or with an optical decoder. The mechanical version has numerous precision, moving parts and is susceptible to breakdown due to dust and grit contamination from the desktop. The precision parts, also, tend to make the mechanical mouse more difficult to manufacture, expensive, and very delicate.

The *optical mouse* has no moving parts and is, therefore, easier and less expensive to make. It tracks its position optically, by passing over an optical grid and counting the lines. The scale of movement can be changed simply by changing the size of the grid. The resolution of the optical mouse is not as fine as the mechanical mouse, but is sufficient for most applications. One drawback is that the optical grid must be kept on your desk when the mouse is in use, increasing the footprint of the computer.

Unlike a digitizing tablet, which uses absolute positioning, the mouse uses relative positioning. In *absolute positioning*, there is a one-to-one correspondence between points on the surface of the tablet and points on the screen. *Relative positioning*, however, is based on the total amount of movement of the positioning device, without reference to where it started or where it stops. For example, if you are trying to move the cursor across the screen and run into the side of the keyboard before you can reach your destination, simply pick the mouse up, reposition it to allow sufficient room, and continue moving the mouse. The cursor will start moving from the point where you left off, in the same direction as the movement as the movement of the mouse.

The number of applications that make use of the mouse is growing daily. Word processing is a hot new area. Several new full-featured word processors, featuring the mouse as an integral tool, are now on the market. While the mouse is useless for typing in the first draft of a document, the editing process can be enhanced tremendously with the mouse. The buttons can be programmed to perform specific editing functions, and the cursor can fly about the screen locating editing changes much more rapidly than is possible with the Apple's cursor control keys. Spreadsheets now make efficient use of the mouse in much the same way as word processors. Graphics packages which allow the user to select, move, enlarge, and paint shapes are becoming very popular. Freestyle drawing is also possible with the mouse. Creating and revising complex graphics can be done in record time. Even programming can be enhanced through use of the mouse.

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## Adam & Eve Paddles

\$34.95

Tech Designs, Inc.

### RATINGS

A Overall rating

### FEATURES

Type: Rotational joystick

**RATINGS**

B Price/performance  
 A Ease of installation  
 A Vendor support

**FEATURES**

Trim tabs: +

**PRODUCT SUMMARY**

The Adam & Eve Paddles are standard, long-life paddles with rotating action and a push button. They come with a 16-pin connector for the Apple II, II + , and IIe.

**AJS200**

\$44.95

TG Products

**RATINGS**

A Overall rating  
 A Price/performance  
 A Ease of installation  
 A Vendor support

**FEATURES**

Type: Joystick  
 Self centering: +  
 Trim tabs: +

**PRODUCT SUMMARY**

The TG Joystick has been around for a number of years and has undergone small modifications during that period. It now is a very high-quality, full-featured joystick available for one of the lowest prices among the quality, brand-name joysticks.

**Apple Joystick**

\$59.95

Apple Computer, Inc.

**RATINGS**

B Overall rating  
 B Price/performance  
 A Ease of installation  
 B Vendor support

**FEATURES**

Type: Joystick  
 Self centering: +  
 Trim tabs: -

**PRODUCT SUMMARY**

The Apple Joystick is a basic joystick which comes with end connectors for either the Apple II or II + , or the Apple IIe and IIc game ports. It contains a normal shaft and has two buttons on the top of the housing.

## Apple Mouse II

II +, IIe—\$149.00

Apple Computer, Inc.

IIc—\$ 99.00

### RATINGS

B Overall rating  
B Price/performance  
B Software compatibility  
B Ease of installation  
A Supplied software  
B Vendor support

### FEATURES

Type:	Mouse
Interface:	Slot or mouseport
Cable length:	4'
Number of buttons:	1

### PRODUCT SUMMARY

The Apple Mouse II (Fig. 17-1) uses the same technology as the mouse for the Apple Macintosh and Lisa. The Apple II, II +, and IIe version comes with an interface card which is installed in a slot on the Apple motherboard. While the device is slot independent, its recommended location is slot 4. Once the interface card is



Fig. 17-1. The Apple Mouse II comes with Apple's excellent graphics program, MousePaint (courtesy of Apple Computer, Inc.).

installed, a connector box is installed on the outside of the Apple, and the mouse's cord is plugged in there. On the Apple *I/c*, the interface "card" is built in, and only the mouse and cord are needed. The cord is plugged into the Mouse/Game Port. Either the mouse or game paddles can be plugged in, but not both (unless you are using a game port extender).

The mouse interface gives you a number of firmware routines which permit you to use the mouse in your own programs. The mouse may be programmed to interrupt the current program at any one of three times: when a key is pressed; when the mouse has been moved; and when the mouse's button has been pushed.

The mouse's position is returned in X and Y coordinates with values between 0 and 65535, although the normal setting is to return values between 0 and 1023. The smallest mouse movement which is noticed is 0.02 inch. The values returned also show whether the mouse's button was pressed at this time or at the previous time.

The mouse's state can be read either from assembly language, using the firmware routines built into the mouse interface card, or from AppleSoft using IN#4 commands. This process is clearly explained in the documentation.

There are a growing number of programs which use the mouse as an alternative input device. These include Bank Street Writer (for the *I/c* and 128K *I/e*), Dollars and Sense (for the *I/c* and 128K *I/e*), and the Jane integrated program (version without its own mouse).

In addition to these programs, the mouse comes with a superb graphics program called MousePaint. This program is based on the MacPaint drawing program written for the Macintosh. MousePaint requires an Apple with at least 64K and, if it is to have its startup menu, Applesoft in ROM.

MousePaint permits drawing, in solid or outline form, rectangles, rectangles with rounded corners, ovals, circles, polygons, and freeform figures. The fill for the solid figures can be in one of 30 patterns.

By specifying an area of the picture to be the editing box, you can move, cut, paste, copy, delete, invert, or flip horizontally or vertically the box. Five different fonts are supplied for adding text to the picture. No provision is made for adding fonts.

The program is strongly reminiscent of the MacPaint program, even to the use of pull-down menus. Users of the Macintosh will find MousePaint familiar, as will MousePaint users switching to the Macintosh.

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## Gibson Light Pen

\$249.00

Koala Technologies Corporation

### RATINGS

A Overall rating  
A Price/performance  
A Software compatibility  
A Ease of installation  
B Supplied software  
A Vendor support

### FEATURES

Type:	Light pen
Slot:	7
Fill/draw software:	+
Ampersand driver software:	+
Cord length:	42"



## PRODUCT SUMMARY

The Gibson Light Pen installs in slot 7 of the Apple II, II + , and IIe. If you want to install it in another slot, you must also install jumper wire to permit the pen to get the necessary video sync signal.

The software which comes with the Gibson Light Pen displays the versatility of the pen. It consists of:

- ☐ Pentrak, a series of ampersand driver routines consisting of commands, callable from AppleSoft, which permit you to create your routines for drawing with the light pen. Functions include drawing, framing, lines, sketching, rubber band lines, high-resolution text, and mirror drawing.

- ☐ Penpainter, which can be used to create patterns on the screen (including rectangles, circles, lines, and mirror drawing) and fill the shapes with patterns. Penpainter can also be used to help create the various patterns.

- ☐ Pendesigner, which permits a variety of different drawing modes including freehand sketch, lines, and rectangles. Grid drawing, in which every point drawn is placed on a grid or lines eight points across, lets you draw quite straight lines. In Pendesigner a portion of the screen can be placed on one of four "file cards." These cards can be saved to disk and the image on them placed anywhere on the screen.

- ☐ PenMusician, which shows an application of the pen to be used in creating music.

- ☐ Penanimator, which uses the pen in creating a form of high-resolution graphics animation.

The various software programs except for Pentrak, are all written in unprotected AppleSoft. Each program consists of many calls to the Pentrak ampersand routines. The listings of these programs provide a helpful tutorial on how to create your own programming using the Pentrak driver.

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## KoalaPad

\$125.00

Koala Technologies Corporation

### RATINGS

A Overall rating  
A Price/performance  
A Software compatibility  
A Ease of installation  
A Supplied software  
A Vendor support

### FEATURES

Type:	Touch Tablet
Drawing area:	4-1/4" square
Cord length:	4'
Buttons:	2
Size:	6" x 8" x 1"
Technology:	Analog

## PRODUCT SUMMARY

The KoalaPad was the first low-cost, digitizer-type tablet. It fits into the game

I/O slot and presents you with a drawing area over which you can press a stylus or your finger. The signal created by the pressure on the tablet is converted into an x and y coordinate and passed to the Apple (as Paddle 0 and Paddle 1 values in the range of 0 to 255). Software then converts the values into a screen position, allowing cursor movement. The tablet also consists of two large buttons, which emit signals equivalent to Button 0 and Button 1.

The KoalaPad can have a plastic overlay put over its drawing surface, and with proper software interfacing it can be used to select various options similar to a menu.

There are a number of software programs available for the KoalaPad. In addition, a few other graphic programs, such as Fontrix and Print Shop, permit input from the KoalaPad. The Koala software includes:

- ☐ Micro Illustrator, which comes with the KoalaPad, permits drawing of shapes, freehand lines, straight lines, circles, and rectangles. The various shapes created can be filled with various colors.

- ☐ Coloring Series 1 and 2, a series of geometric, Logo designed shapes, which can be read into the Micro Illustrator and then colored using the fill mode. This represents a form of high-tech coloring book.

- ☐ KoalaGrams, a spelling program.

- ☐ Spider Eater, a music playing and education program that makes use of a special plastic overlay.

- ☐ Logo Design Master, a program with a special plastic overlay, which permits drawing of Logo shapes and saving the shapes as special Logo procedures. The program runs under either Apple Logo (but not Apple Logo II), and M.I.T. Logo versions, such as Terrapin Logo and Krell Logo.

- ☐ Instant Programmer's Guide, which gives samples of programming use of the KoalaPad in both high-resolution graphics and on the text screen, and the creation of special plastic overlay menus.

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## Kraft Joystick

\$49.95

Kraft Systems

### RATINGS

B Overall rating

B Price/performance

A Ease of installation

B Vendor support

### FEATURES

Type:

Joystick

Self centering:

+

Trim tabs:

+

### PRODUCT SUMMARY

The Kraft Joystick is a standard joystick, except for one factor. It has one button on the top of the housing and the other on the side of the housing. This feature is supposed to make it easier to play certain types of games.

## Mach III

\$49.95

CH Products

### RATINGS

A Overall rating  
B Price/performance  
A Ease of installation  
A Vendor support

### FEATURES

Type:	Joystick
Self centering:	+
Trim tabs:	+

### PRODUCT SUMMARY

The Mach series of joysticks, from CH Products (formerly Hayes Products), consists of the Mach II and Mach III joysticks. Each consists of the relatively short joystick shaft atop a joystick housing. On the top of the housing, on two sides next to a common corner, are two pushbuttons for buttons 0 and 1. In addition, on the Mach III, there is a pushbutton (corresponding to another button 0) on the end of the joystick shaft.

---

## Magellan Light Pen

\$149.95

Magellan Computer, Inc.

### RATINGS

B Overall rating  
A Price/performance  
B Software compatibility  
B Ease of installation  
B Supplied software  
A Vendor support

### FEATURES

Type:	Light pen
Slot:	Game port
Fill/draw software:	+
Ampersand driver software:	+
Cord length:	54"

### PRODUCT SUMMARY

The Magellan Light Pen installs in the 16-pin DIP socket game I/O in the Apple II, II+, and IIe. There is a 16-pin DIP socket on the back of the light pen board which fits inside the game I/O so you can install a game paddle or joystick in addition to the light pen. In the Apple IIe, you must not have anything plugged into the external, 9-pin game I/O when you plug in the light pen.

Installation is somewhat difficult compared to placing a card in a slot. You must first remove anything that is in the game I/O socket, plug in the small board, reinstall the game paddles or joystick in the back of the board, remove anything on the video output pins, install a short jumper to the video output pins, and reinstall whatever was on the video output pins on the new pins on the pen's board. While this process sounds more difficult than it is, it does take a little bit of time, especially the first time through. You need to be sure that the various connections are oriented correctly, although the directions for this procedure are quite clear.

The pen will work in any Apple II, II+, or IIe with at least 48K of memory. Very old Apple IIs may need a special version of the light pen in view of different timing signals present on these older machines.

The pen comes with the following software:

☐ Amperpen, a series of ampersand commands which can be used from AppleSoft to sketch with the pen, track its movements, draw circles and rectangles, clear the high- and low-resolution graphics screens to specified colors, and read the condition of the pen's switch.

☐ Quick Draw, which creates and edits high-resolution pictures, drawings, and designs. Commands include lines, rectangles, circles, text (using built-in fonts or fonts created using the Apple Mechanic program from Beagle Brothers), fill, and zoom (or closeup).

The software is usable although it is not as extensive as that available for the Gibson Light Pen. At times it functions a bit jerkily.

The pen comes with a 90-day warranty.

---

## Paddlesticks

\$44.95

CH Products

### RATINGS

A Overall rating  
B Price/performance  
A Ease of installation  
A Vendor support

### FEATURES

Type:	Joystick
Self centering:	—
Trim tabs:	—

### PRODUCT SUMMARY

The Paddlesticks are single axis, non-rotating paddles. They come with a 16-pin connector for the Apple II, II+, and IIe. To operate the paddle, you push a lever back and forth, rather than rotating a knob, as on standard rotational paddles.

---

## Power Pad

\$99.95

Chalk Board, Inc.

### RATINGS

B Overall rating  
B Price/performance  
B Software compatibility

### FEATURES

Type:	Touch tablet
Drawing area:	12" square
Cord length:	3'

## RATINGS

A Ease of installation  
A Supplied software  
B Vendor support

## FEATURES

Buttons: 0  
Size: 17" × 20" × 1"  
Technology: Digital

## PRODUCT SUMMARY

The Power Pad (Fig 17-2) is a much larger, more substantial unit than the Koala Pad. It uses a series of digital switches to create the signal that is transmitted to the computer. Unfortunately, the documentation does not explain how that signal is received by the computer, although it is transmitted through the game I/O port in some manner. The use of digital switches permits the Power Pad to report several points on the board that are being touched at the same time. This is not possible with an analog unit like the KoalaPad, which averages the signals received from throughout the board into one location before transmitting that value to the Apple.

A number of different options are available for the Power Pad. The basic unit is \$99.95; an Apple starter kit, containing a copy of Micro Illustrator similar to that found on the KoalaPad costs extra. A version of the Power Pad for the Apple IIc is available bundled with two programs—Super Graphics and Leo's Links—for \$199.00.

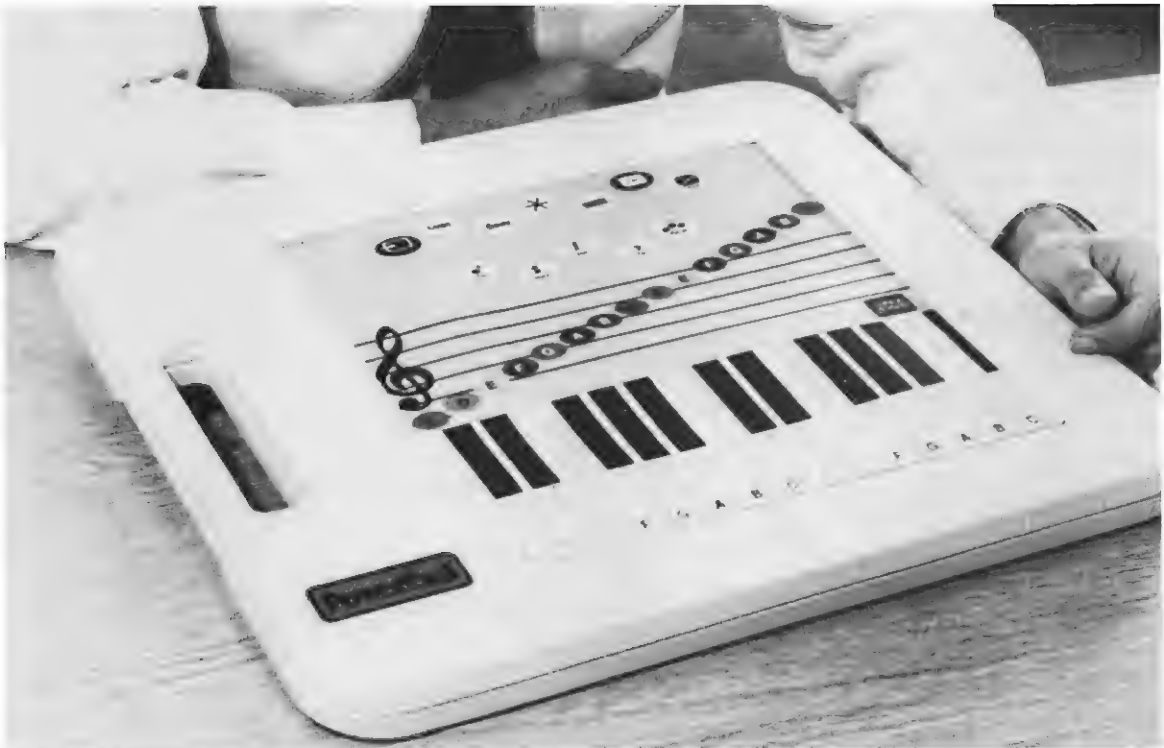


Fig. 17-2. The Power Pad's large size makes it especially useful for children (courtesy of Chalkboard, Inc.).

Software written for the Power Pad is available for between \$24.95 and \$49.95 and includes the following:

- ☐ Leo's 'Lectric Paintbrush, which is best described as high-tech, high-resolution finger painting.
  - ☐ Micro Maestro, a music program which transforms the Power Pad into a piano keyboard.
  - ☐ A programming kit for using the Power Pad in your own programs.
  - ☐ Music Math, a mathematics teaching program using music.
  - ☐ Leo's Links, a golf game which also teaches the principles of geometry.
  - ☐ Logic Master, a Mastermind type of game.
  - ☐ Bearjam, a reading readiness program for preschoolers.
- 

## **WORKSHEET FOR POINTING DEVICES**

**PRODUCT**

\$ .

**MANUFACTURER**

**TYPE:**

### **RATINGS**

Overall rating  
Price/performance  
Software compatibility  
Ease of installation  
Supplied software  
Vendor support

### **PRODUCT SUMMARY**

Table 17-1. Comparative Ratings for Pointing Devices.

DEVICE	PRICE	RATINGS					
		1	2	3	4	5	6
<u>JOYSTICKS</u>							
Adam & Eve Paddles	\$ 34.95	A	B	-	A	-	A
AJS200	44.95	A	A	-	A	-	A
Apple Joystick	59.95	B	B	-	A	-	B
Kraft Joystick	49.95	B	B	-	A	-	B
Mach III	49.95	A	B	-	A	-	A
Paddlesticks	44.95	A	B	-	A	-	A
<u>MOUSE</u>							
Apple Mouse II	II + , //e 149.00	B	B	B	B	A	B
<u>LIGHT PEN</u>							
Gibson Light Pen	249.00	A	A	A	A	B	A
Magellan Light Pen	149.95	B	A	B	B	B	A
<u>TOUCH TABLETS</u>							
KoalaPad	125.00	A	A	A	A	A	A
Power Pad	99.95	B	B	B	A	A	B
<u>KEY TO RATINGS</u>							
1—Overall rating	4—Ease of installation						
2—Price/performance	5—Supplied software						
3—Software compatibility	6—Vendor support						

Table 17-2. Comparative Features for Pointing Devices.

DEVICE	FEATURES	
	1	2
Adam & Eve Paddles	-	+
AJS 200	+	+
Apple Joystick	+	-
Kraft Joystick	+	+
Mach III	+	+
Paddlesticks	-	-

	1	2	3
Apple Mouse II	Slot/ Mouseport	4'	1

	1	2	3	4
Gibson Light Pen	7	+	+	42"
Magellan Light Pen	Gameport	+	+	54"

	1	2	3	4	5
KoalaPad	4 1/4" sq	4'	2	6" x 8" x 1"	Analog
Power Pad	12" sq	3'	0	17" x 20" x 1"	Digital

<b>KEY TO FEATURES</b>	
<b>JOYSTICK</b>	<b>LIGHT PEN</b>
1—Self centering	1—Slot
2—Trim tabs	2—Fill/draw software
	3—Amperes and drive software
<b>MOUSE</b>	4—Cord Length
1—Interface	<b>TOUCH TABLET</b>
2—Cable length	1—Drawing area
3—Number of buttons	2—Cord length
	3—Buttons
	4—Size
	5—Technology



# Chapter 18



## Keyboard Replacements and Enhancements

The keyboard that comes with the Apple II and II+ is less than ideal. Even that which comes with the Apple IIe and IIfx lacks some functions which are helpful. None of the keyboards have a *numeric keypad*, a section where the number keys (usually in connection with several other function keys) are arranged much as they are on the keypad of an electronic calculator. None of the keyboards contain *programmable function keys*, keys that can be assigned characters or commands, each of which is executed when its key is pressed.

The Apple II and II+ keyboard is also deficient in two other ways. It generates only uppercase letters. The shift key on the keyboard only works with the number and symbol keys to select between the two characters on that key. It is also missing several symbols, including [, {, }, |, \, ^, and ~.

A variety of methods are used to get around these limitations. Some are software, such as a program which turns a portion of the keyboard into a keypad, generating numbers when certain letters are pressed. Other solutions are simple user installations, such as connecting a wire between the keyboard and a chip on the Apple II/II+ motherboard. The result is a quasi-functional shift key (the so-called *shift key mod*).

There is also a variety of hardware solutions to the keyboard problems. Some, like replacement keyboards, function in place of the Apple keyboard. Others, like specialty keyboards and keypads, function alongside of the Apple keyboard. Still others, like keyboard enhancers, are grafted onto the keyboard and improve its functions.

## **REPLACEMENT KEYBOARDS**

Replacement keyboards work in several ways. They all require a small amount of disassembly of your Apple for installation and all do not actually physically replace the original Apple keyboard but connect to the computer. Some require you to switch between the Apple keyboard and the replacement keyboard, either with a physical switch or a software command. Others have both keyboards active at the same time. That code of whichever keyboard's key is pressed is transmitted to the computer.

Replacement keyboards vary in a number of respects. Many of the nonstandard typewriter keys (escape, {, }, |, \, control, function keys, and cursor movement keys) are located in a variety of places. You should check that the layout of the particular keyboard is comfortable and logical to you. The touch of the keys is also important. Some keyboards have a lighter touch than others. You should try them out to be sure the particular keyboard you select is comfortable to your typing style.

Function keys are another area of variety among replacement keyboards. Not only do the keyboards differ as to the functions which are implemented, but some support user programming of the function keys, while others restrict you to either preprogrammed keys or to program modules which you must purchase at additional cost. The flexibility of programmable function keys is normally preferable. If you are a fast touch typist, however, use of function keys may actually slow you down.

The physical size of the keyboard should also be considered. Since it will have to occupy desk space along with the rest of your computer setup, make sure it will fit comfortably on your desk. Also check that its height and slant are comfortable for the way you type.

## **SPECIALTY KEYBOARDS**

Specialty keyboards are basically a collection of programmable function keys gone to an extreme. The keyboard may be designed for a specific use (such as data input and manipulation for a spreadsheet) or for general use. Since most specialty keyboards do not contain a full set of standard typewriter keyboard keys (or contain only membrane-type keys), you should not plan on doing touch typing with them. Indeed, one of the questions to consider when selecting a specialty keyboard is whether the keyboard would actually result in an increase in speed or efficiency, considering the need to use the standard Apple keyboard for some functions.

## **KEYBOARD ENHANCERS**

Keyboard enhancers are usually found only for the Apple II and II+ computers. They provide upper- and lowercase letter input, often with true shift key action. The enhancers often supply a means to generate the characters normally missing from the Apple II and II+ keyboards.

A numeric keypad is a useful means of entering large amounts of numeric data, particularly if you often use a calculator. Keypads vary significantly in the other functions they offer, including math keys, decimal points, enter key, and cursor movement keys. You should carefully consider your needs and uses for the keypad when deciding whether the additional functions are worth any additional cost. You should

also be sure that the keypad will fit on your computer desk and that it is comfortable to use. Some pads are quite light and tend to slide around a lot when used.

---

## Apple Numeric Keypad II

\$159.95

Apple Computer, Inc.

### RATINGS

B Overall rating  
A Price/performance  
A Software compatibility  
B Ease of installation  
A Documentation  
B Vendor support

### FEATURES

Type:	Numeric keypad
Math functions:	Full
Extra keys:	+
Plug in:	+

### PRODUCT SUMMARY

The Apple keypad is one of the more full-featured keypads. It has 24 keys for the standard numbers, as well as keys for double zero, decimal point, left and right arrow, escape, space, parentheses, return, and all four basic math functions. It plugs into the Apple *I*le or into a piggyback board on the Apple II and II+.

---

## Enhancer II

\$149.00

Videx

### RATINGS

A Overall rating  
B Price/performance  
A Software compatibility  
B Ease of installation  
B Documentation  
A Vendor support

### FEATURES

Type:	Lowercase modification
+	Lowercase display
True shift key:	+
Type ahead buffer:	+

### PRODUCT SUMMARY

The Enhancer II is a lowercase keyboard modification designed for the Apple II and II+ with a Rev. 7 or later motherboard. It gives the Apple II or II+ full upper- and lowercase entry and display capabilities and a standard, typewriter-style shift key. It does not work on and is not needed by the Apple *I*le.

There are a number of additional features the Enhancer gives to your Apple II or II+, including automatic key repeat at the rate of 15 characters per second, fast key repeat at the rate of approximately 50 characters per second, caps lock and shift lock function, and entry of all 128 ASCII codes from the keyboard. There is

a 128-character type ahead buffer which can be disabled if it interferes with computer operation (as it does with some games).

If you want a Dvorak keyboard layout with the Enhancer II, there are two ways you can get it. You can purchase the Dvorak Eprom from Videx, in which case your keyboard will permanently have the Dvorak layout. Instead, you can load in the layout from the utilities disk and specify that it overlays the standard QWERTY layout.

There is also an optional function strip (\$79.00) that provides 16 programmable function keys. The keys are on a membrane pressure-sensitive strip which fits across the top of your Apple.

The function strip and Enhancer are available for a combined price of \$215.

---

## EPS Keyboard

\$349.50

Executive Peripheral System, Inc.

### RATINGS

B Overall rating  
B Price/performance  
B Software compatibility  
B Ease of installation  
A Documentation  
A Vendor support

### FEATURES

Type:	Full keyboard
Function keys:	+
Programmable keys:	+
Numeric keypad:	+
Cable length:	6' coiled

### PRODUCT SUMMARY

The EPS keyboard is really five separate keyboards in one. It has a standard QWERTY keyboard, an enhanced numeric keypad, an edit keypad, a cursor control keypad, and programmable function keys.

The numeric keypad has standard numbers, a decimal point, comma, left and right arrows, math functions (add, subtract, multiply, and divide), double and triple zeroes, and an enter key.

The edit keypad includes character and line insert and delete, search, and replace functions. The cursor control pad includes up, down, left, right, word left and word right keys.

The 12 function keys are programmed by a number of plug-in modules. Four functions can be assigned to each key: normal, shifted, control, and shift-control. In addition, the program for the function keys can be toggled between two entirely separate programs, permitting a total of 96 key functions for each module. Among the preprogrammed modules are BASIC/DOS with VisiCalc, WordStar with BASIC and CP/M, and Applewriter II and BASIC/DOS. Modules under development include those for PFS: File, Screenwriter II, DB Master, dBASE II, Pie Writer, Multiplan, SuperCalc, and Pascal.

Each plug-in module costs \$32.95. A design-your-own module kit is available for \$75.

The keyboard installs as is on the Apple II and II+. To install it in the Apple IIe, you need to purchase a special IIe interface (\$75.00).

Other options available for the EPS include a 20-foot cord (\$35.00), and a soft-switch for alternating between the EPS keyboard and the standard Apple keyboard (\$40.00).

The unit is 19 × 9 × 2 inches and weighs 5 1/2 pounds.

---

## Keyport 717

\$179.00

Polytel Computer Products Corp.

### RATINGS

B Overall rating  
A Price/performance  
B Software compatibility  
A Ease of installation  
B Documentation  
A Vendor support

### FEATURES

Type:	Specialty keyboard
Function keys:	+
Programmable keys:	+
Numeric keypad:	+
Cable length:	9' flexible

### PRODUCT SUMMARY

The Keyport 717 is a flat membrane keyboard which attaches to the Apple game I/O slot. It features 717 user-programmable keys with plastic overlays to indicate the programmed functions.

The keyboard must first be calibrated by pressing a row and a column of keys, as directed by the calibration program. This needs only to be done when first setting up the keyboard. It is required later only if there have been significant changes in room temperature or atmosphere, or if you have moved the keyboard a long distance.

The keyboard needs a software interface. By itself it just sends a group of signals to the game I/O port. User-designed interfacing is possible, although it is a bit complex, and the documentation is a bit weak on this point. The keyboard definition function program is available only in DOS or ProDOS, not the p-System or CP/M. To use the keyboard in the latter two systems, you need to be a reasonably accomplished assembly language programmer.

The keyboard comes with a BASIC overlay, which provides a variety of AppleSoft and DOS commands. Many of these command keys are time-savers, such as pressing one key for "TEXT: HOME" which saves eight keystrokes. Others are also [human] memory savers, such as the color button which generates the COLOR = # low-resolution graphic commands. Using the color buttons obviates the necessity of remembering the color numbers.

Optional overlays include a VisiCalc function overlay (\$39.00), and a "Farm" overlay (\$29.00). The farm overlay includes a variety of games which should delight and educate the prereading and beginning reading child.

## Key Tronic KB200

\$298.00

Key Tronic Corporation

### RATINGS

B Overall rating  
B Price/performance  
B Software compatibility  
B Ease of installation  
B Documentation  
A Vendor support

### FEATURES

Type:	Full keyboard
Function keys:	+
Programmable keys:	-
Numeric keypad:	+
Cable length:	9' flexible

### PRODUCT SUMMARY

The Key Tronic keyboard is a look-alike to the IBM-PC keyboard. It measures  $17 \frac{3}{4} \times 7 \frac{1}{2} \times 1 \frac{1}{4}$  inches and weighs  $3 \frac{1}{2}$  pounds. It works with the Apple II and II+, but not the IIe or the IIfx.

The caps lock key has an LED indicator in it which shows when it is engaged. Most of the function keys are included in a function keypad, which has a variety of preprogrammed keys including PR#6, LOAD, RUN, SAVE, CATALOG, DELETE, STOP (Control-C), DELETE LINE (Control-X), CLEAR TO END OF LINE [CLR EOL] (Escape-E), and LIST. In addition there are three other functions keys at various locations on the keyboard for HOME, BREAK, and TAB. The TAB key does not generate a Control-I but merely prints the word *TAB*.

The numeric keypad has the normal set of numbers, a decimal point, plus and minus signs, and a return key.

The keyboard has collapsible feet which allow you to set it up at a comfortable angle for typing. It has a nice light touch to the keys.

---

## Keywiz VIP

\$439.00

Creative Computer Peripherals

### RATINGS

B Overall rating  
B Price/performance  
A Software compatibility  
C Ease of installation  
A Documentation  
A Vendor support

### FEATURES

Type:	Specialty keyboard
Function keys:	+
Programmable keys:	+
Numeric keypad:	-
Cable length:	2'

### PRODUCT SUMMARY

The Keywiz VIP consists of 31 programmable keys and is designed as an auxiliary command keypad for the Apple II family. Each of the 31 keys contains two commands—one regular and one shifted. In addition, you can shift between any of

4 different command "boards," allowing 248 command keys at once.

To program any key, you simply press the *program key* (the key to which the command is to be assigned) and then up to eight keystrokes which will be assigned to that key. The commands for each key are kept in nonvolatile memory which is not lost when the power is turned off.

The Keywiz VIP comes with blank templates which fit over the keypad, specifying what function has been assigned to each key. In addition there is an AppleSoft and Pascal template which recommend specific key assignments.

During use, an LED displays which of the four keyboards is currently active. The Keywiz VIP comes with a 1-year warranty and is powered by a separate, calculator-type power supply unit.

A less expensive Keywiz, Model 83, has 30 preprogrammed keys and a numeric keypad for either VisiCalc, Multiplan, CalcStar, MagiCalc, WordStar, AppleWriter, Format II, or Magic Window II. It is available for \$299.00

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## KVA II Multi Function

\$199.00

Omega Micro

### RATINGS

B Overall rating  
B Price/performance  
A Software compatibility  
A Ease of installation  
B Documentation  
B Vendor support

### FEATURES

Type:	Numeric keypad
Math functions:	(+ -)
Extra keys:	+
Plug-in:	+

### PRODUCT SUMMARY

This basic keypad has a plug-in controller board for the Apple II and II+ and directly plugs into the Apple IIe. It has the standard number keys, a plus and minus sign, a decimal point and a return key.

---

## The Keypad

\$125.00

Advanced Business Technology

### RATINGS

B Overall rating  
B Price/performance  
A Software compatibility  
B Ease of installation  
B Documentation  
B Vendor support

### FEATURES

Type:	Numeric keypad
Math functions:	(-)
Extra keys:	+
Plug-in:	+

## PRODUCT SUMMARY

The Keypad comes in two models. Model B, for the Apple *IIfx* and Apple II or II+ with a Rev. 7 or later motherboard, merely plugs into the Apple. Model A, needed for older Apples, requires some soldering.

The keypad contains the number keys, minus sign, decimal point, and a return key. It is small and lightweight, and therefore a bit unstable.

---

### *IIfx* Tender Keypad

\$199.00

Trackhouse

#### RATINGS

A Overall rating  
A Price/performance  
A Software compatibility  
B Ease of installation  
B Documentation  
B Vendor support

#### FEATURES

Type:	Numeric keypad
Math functions:	Full
Extra keys:	+
Plug-in:	-

## PRODUCT SUMMARY

The *IIfx* Tender Keypad, for the Apple *IIfx* only, features a full complement of basic math functions, four directional cursor control keys, numeric keys, decimal point, comma, space, and delete. It comes with special software which turns your Apple *IIfx* into a fixed- or floating-point calculator.

The company also makes a nonprogrammable keypad which can be used with the Apple *IIfx*, II, or II+.

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## WORKSHEET FOR KEYBOARDS

### PRODUCT

\$ .

MANUFACTURER

TYPE:

#### RATINGS

Overall rating  
Price/performance  
Software compatibility  
Ease of installation  
Documentation  
Vendor support

#### FEATURES

## PRODUCT SUMMARY



Table 18-1. Comparative Ratings for Keyboards.

DEVICE	TYPE	PRICE	RATINGS
			<u>1 2 3 4 5 6</u>
Apple Numeric Keypad	N	\$159.95	B A A B A B
Enhancer II	L	149.00	A B A B B A
EPS Keyboard	K	349.50	B B B B A A
Keyport 717	K	179.00	B A B A B A
Key Tronic KB200	K	298.00	B B B B B A
Keywiz VIP	K	439.00	B B A C A A
KVA II Multi Function	N	199.00	B B A A B B
The Keypad	N	125.00	B B A B B B
IIe Tender Keypad	N	199.00	A A A B B B
<p><b>KEY TO RATINGS</b></p> <p>1—Overall rating 2—Price/performance 3—Software compatibility 4—Ease of installation 5—Documentation 6—Vendor support</p> <p><b>TYPE</b></p> <p>N—Numeric keypad K—Keyboard L—Lowercase modification</p>			

Table 18-2. Comparative Features for Keyboards.

DEVICE	NUMERIC KEYPAD FEATURES			
	<u>1</u>	<u>2</u>	<u>3</u>	
Apple Numeric Keypad II	F	+	+	
KVA II Multi Function	(+ -)	+	+	
The Keypad	(-)	+	+	
IIe Tender Keypad	F	+	-	
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>
Keyport 717	+	+	+	9' flex
Key Tronic KB200	+	-	+	9' flex
Keywiz VIP	+	+	-	2'
	<u>1</u>	<u>2</u>	<u>3</u>	
Enhancer II	+	+	+	
<p><b>KEY TO FEATURES</b></p> <p><b>NUMERIC KEYPAD</b></p> <p>1—Math functions 2—Extra keys 3—Plug in</p> <p><b>KEYBOARD</b></p> <p>1—Function keys 2—Programmable keys 3—Numeric keypad 4—Cable length</p> <p><b>LOWER CASE MOD</b></p> <p>1—Lowercase display 2—True shift key 3—Type ahead buffer</p>				

# Chapter 19



## Z-80 Coprocessors

Every computer has one or more operating systems, a set of routines for handling frequently occurring activities. Operating systems contain, for example, the detailed sequences of instructions for the input and output of data, including taking information from the keyboard, displaying it on the screen, and exchanging it with the disk drive. The operating system also performs the routine housekeeping activities.

The operating system usually works in conjunction with your applications software. Its repertoire of routines is available to your software's commands. For example, when your program gives a PRINT command, the operating system takes over, runs through a complex exchange of signals with the printer, does out the data, and then returns control to your program.

An operating system can only respond to commands defined by its instruction set. This is the logic coded into the operating system's program in the computer's memory. Different operating systems have differently coded logic. Therefore, every applications program must be written for a specific operating system. As a general rule, a program written for one operating system will not run on another system.

Various operating systems exist for the Apple, including ProDOS, DOS 3.3, and the p-System. These systems, which deal with disk operations, are known as disk operating systems. Underlying all of them is the Apple system monitor, a series of low-level commands which deal with screen and keyboard operation. The various operating systems were either written for the 6502 or 65C02 microprocessor in the Apple, or like the p-System, adapted for it.

One operating system which does not run on the 6502 or 65C02 microprocessor

is the CP/M system (Control Program for Microcomputers). It requires a Z-80, 8080 or 8085 microprocessor. Many business microcomputers use the CP/M system. In fact, this system has generated the world's largest library of business and personal software, containing some of the most popular business applications. CP/M offers you languages such as FORTRAN and Pascal, and applications software such as WordStar, SuperCalc, MultiPlan, and dBase II. CP/M also has a public domain library containing over 80 disks of programs.

The Apple could have greatly enhanced versatility if it could run CP/M. This ability is provided by a *Z-80 coprocessor*, a plug-in card which features a Z-80 microprocessor and supporting circuitry. It turns the Apple into a Z-80 computer which can run CP/M. Let's first take a closer look at the nature of CP/M.

CP/M is a disk operating system. That is, its set of routines deal principally with data input and output from a disk. At initial startup, this set of programs automatically loads into the temporary memory of a suitably prepared computer. Being disk-based gives CP/M great portability. As long as the disk drive can read the format of the disk, most CP/M applications software will run on any CP/M-compatible machine. With the same formatting proviso, programs and files prepared on one CP/M setup will run on any other. Sometimes a small amount of customization is needed, however. This task is aided in most CP/M application by an Install program, which provides the needed commands based on your responses to questions about your system.

For non-CP/M machines, such as the Apple, running CP/M involves some hardware changes because CP/M was developed for the Z-80 and 8080 microprocessor chips. These two chips have almost identical instruction sets, but they are quite different from the counterpart chips of the Apple.

To run on the Apple, the applications program must be in a disk format compatible with the Apple Disk system, unless you have another type of disk drive properly interfaced to your Apple. Alternatively, you can obtain CP/M software via a modem (see Chapter 8).

Structurally, CP/M consists of three functional modules: the *console command processor* (CCP), which interprets typed-in commands; the *basic input/output system* (BIOS), which handles communication with peripheral devices, such as printers, disk drives, and modems; and the *basic disk operating system* (BDOS), which manages disk files. These three components occupy the top part of the computer's memory.

At the bottom portion of memory, a *small system parameter area* (SPA), maintains information about the current disk identification, the user identification, the peripheral device assignments, and other parameters.

The remaining and largest portion of memory, the *transient program area* (TPA), takes in the currently executed program.

As previously noted, when you boot the system, the CCP, BIOS, and BDOS load from the CP/M system diskette into the computer's main memory. The BIOS takes over, and "A " appears at the upper left corner of the screen, indicating readiness for typed-in commands and the loading of any executable file.

## ALS CP/M Card

\$399.00

Advanced Logic Systems

### RATINGS

B Overall rating  
B Price/performance  
A Software compatibility  
A Ease of installation  
B Documentation  
B Vendor support

### FEATURES

Operating system:	CP/M 3.0
Chip type:	Z-80B
Operating speed:	6 MHz
Memory on card:	64K
80-column display:	-
Clock:	+
Z-80 interrupts:	+

### PRODUCT SUMMARY

The CP/M card is a joint project of ALS and Digital Research, developers of the CP/M operating system. It is one of only two Apple CP/M cards which run CP/M 3.0, also called CP/M Plus.

The card will automatically use a Videx Videoterm or an ALS Smartterm 80-column display card in slot 3. Installation consists of merely placing the card in the proper slot (4 is recommended) and turning on the machine.

The on-card clock, which must be reset each time you start CP/M, will provide interrupts as well as date and time stamping of the files. This is a standard CP/M Plus function. In addition, CP/M Plus function permits you to switch disks without having to do a warm boot (pressing Control-C). In CP/M 2.2 you run a considerable risk of a program bombing if you do not warm boot after switching disks.

CP/M Plus holds more data in memory than CP/M 2.2 (approximately 6 to 7 more pages of text) and runs up to three times faster.

The ALS CP/M card works in an Apple II, II+, and IIe.

---

## Appli-Card

4 MHz—\$295.00

Personal Computer Products, Inc.

6 MHz—\$375.00

### RATINGS

B Overall rating  
B Price/performance  
B Software compatibility  
A Ease of installation  
B Documentation  
B Vendor support

### FEATURES

Operating system:	CP/M 2.2
Chip type:	Z-80A or Z-80B
Operating speed:	4 or 6 MHz
Memory on card:	64K
80-column display:	- (70 column)
Clock:	-
Z-80 interrupts:	-

## PRODUCT SUMMARY

The Appli-Card is unique among Z-80 coprocessors in that it permits use of either a 40-column standard Apple display, an 80-column display using your 80-column card in slot 3 (the auxiliary slot in the Apple *IIf*), or a special 70-column, high-resolution graphics, simulated text display. This latter technique, often referred to as a *soft seventy display*, is useful for viewing printed material up to 70 columns across, but it is hard on the eyes for work of any length.

The card will automatically select an 80-column card if it is in slot 3 or the Apple *IIf* auxiliary slot. Horizontal scrolling up to 255 columns is supported, a useful feature when the actual line length exceeds the screen display line length.

The Appli-Card comes with 64K of RAM on the card and can be expanded to 192K through the use of extender boards. The 64K RAM can be used as a RAM disk in the non-CP/M environment.

The card comes with the CP/M operating system and utilities including a program to transfer files from DOS 3.3 to CP/M and from CP/M to DOS 3.3. The Appli-Card recognizes the one-wire shift key modification on the Apple II and II+. The card runs on the Apple II, II+, and *IIf*.

---

### CP/M Gold Card

64K not banked—\$495.00

Digital Research

192K banked—\$775.00

128K disk cache—\$325.00

### RATINGS

B Overall rating  
B Price/performance  
A Software compatibility  
B Ease of installation  
B Documentation  
B Vendor support

### FEATURES

Operating system:	CP/M 3.0
Chip type:	Z-80B
Operating speed:	6 MHz
Memory on card:	64-192K
80-column display:	+
Clock:	+
Z-80 interrupts:	+

## PRODUCT SUMMARY

Digital Research is the developer and licensor of the CP/M operating system. The Gold Card is its first Apple CP/M hardware product.

The card runs CP/M 3.0, also called CP/M Plus. This operating system supports many features not available in CP/M 2.2 and corrects several annoying problems in that system. For example, it permits date and time stamping of files and comes with a help function. CP/M Plus, however, is fully upwardly compatible with CP/M 2.2. All programs which make standard operating system calls in CP/M 2.2 will run under CP/M Plus. Problems will occur with programs which made nonstandard operating system calls or which made firmware calls. For example, WordStar and dBase II work without problems in CP/M Plus. Z-Term does not.

The card comes with two large manuals, among the best written documentation yet released by Digital Research. Unfortunately, the documentation still suffers from an excessively technical tone and is difficult to follow at times. The issue of redefining keystrokes is described in an especially cryptic fashion. Fortunately, the disk Help File explains this process better.

In addition to the CP/M 3.0 operating system, the card comes with a CBASIC compiler. This is not the standard Microsoft BASIC language familiar to users of the Softcard but is a relatively full-featured BASIC which is compiled to intermediate code. You must still have the run-time interpreter in memory to run the program. The compiler does not generate true machine code. Neither does it support Apple graphics. Other software includes a macro assembler (for 8080 operations codes) and a symbolic instruction debugger.

Installation of the Gold Card is slightly more complex than installing similar Z-80 coprocessors. In addition to putting the card in slot 4 or 7, you must connect a wiring harness, one plug to the video output on the back of the Apple and the other plug to the rear of your monitor. This permits automatic shifting of the video output from the standard Apple 40-column display to the 80-column display of the Gold Card. There are two problems with this setup:

☐ The connector cord on the wire harness is quite short. If your monitor is not on or quite near to the back of your Apple, you will need to purchase an extension cable from an electronics supply store. While these cables are fairly inexpensive and easy to find, Digital Research should have provided a slightly longer cord.

☐ The 80-column display is not accessible except from CP/M; so you need another 80-column display for use in ProDOS, DOS 3.3, and Pascal. If you use an 80-column display which requires a separate connector (as do most on the Apple II and II+), you must switch connectors when moving in and out of CP/M.

The clock on the card must be reset each time you start up the system. In this way it resembles the MS-DOS clock on the IBM.

The card comes in two versions. The standard (or nonbanked version) has 64K of memory on the card. The banked version comes with 192K of memory, permitting use of part of the memory as a RAM disk. A 128K add-on disk cache is available which converts the 64K version to the 192K version.

Neither the memory, clock, or 80-column display on the card are accessible except through CP/M. The product comes with a 1-year warranty. It works on the Apple II, II+, and IIe.

---

## E-Z Card

\$60.00

Orbital System

### RATINGS

B Overall rating  
A Price/performance

### FEATURES

Operating system:	None
Chip type:	Z-80A

## RATINGS

C Software compatibility  
A Ease of installation  
B Documentation  
B Vendor support

## FEATURES

Operating speed:	4 MHz
Memory on card:	0
80-column display:	-
Clock:	-
Z-80 interrupts:	-

## PRODUCT SUMMARY

This card is the economy way to obtain a Z-80 coprocessor for your Apple. It comes as a kit which you must put together by assembling the parts and soldering them. You can, for an addition \$30.00, get the card assembled and tested. If you buy the kit and are unable to get it together properly, the manufacturer will do so for \$30.00 plus \$2.50 shipping.

The card runs CP/M 2.2 and is compatible with the Microsoft Softcard version of the operating system and BASIC language. Unfortunately, the card does not come with the operating system, and the operating system is not available from others except with hardware.

The E-Z card comes in different versions for the Apple II/II+ and the Apple IIe. Be sure to specify the correct version when ordering. Orbital Systems gives a "lifetime" warranty on the card.

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## Premium SoftCard IIe

\$495.00

Microsoft Corporation

## RATINGS

B Overall rating  
B Price/performance  
B Software compatibility  
A Ease of installation  
A Documentation  
B Vendor support

## FEATURES

Operating system:	CP/M 2.2
Chip type:	Z-80A
Operating speed:	6 MHz
Memory on card:	64K
80-column display:	+
Clock:	-
Z-80 interrupts:	-

## PRODUCT SUMMARY

Microsoft was the company that produced the first Z-80 card for the Apple; it has come up with a nice multiple-function CP/M card in the Premium SoftCard IIe. Installation, like that of most Z-80 coprocessors, consists of merely putting the card in a slot. The Premium SoftCard must be placed in the auxiliary slot of the IIe. Once installed, the 80-column display and extended memory of the Premium SoftCard can be used from any Apple operating system, including ProDOS, DOS 3.3, and the p-System.

The card comes with the CP/M 80 operating system which consists of the standard CP/M utilities and special utilities for the Apple. These Apple utilities include a file transfer program, which permits transfer of files from the Apple DOS 3.3 disk

environment to the CP/M disk environment. Unfortunately, there is no reverse transfer program offered with the disk, although there are some commercially available and public-domain reverse transfer programs. Other "standard" CP/M features are 8080 assembler and debugger.

As would be expected with a product from Microsoft, the Premium SoftCard comes with the latest CP/M version of Microsoft BASIC, version 5.2. There are two versions provided: MBASIC and GBASIC. GBASIC contains all the commands of MBASIC plus Apple high-resolution graphics commands. Additional programming language features available in Microsoft BASIC, which are lacking in AppleSoft, include PRINT USING, WHILE/WEND, IF-THEN-ELSE, and up to 16 digit (double precision) variables. A compiler for Microsoft BASIC is available at extra cost.

Documentation consists of two manuals. The quality is generally excellent. In addition, there is a book on CP/M, with special consideration given for Apple users, included with the package.

Microsoft covers the Premium SoftCard *I*ie with a 1-year warranty. The Premium SoftCard *I*ie only works on the Apple *I*ie.

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## SoftCard II

\$225.00

Microsoft Corporation

### RATINGS

B Overall rating  
B Price/performance  
B Software compatibility  
A Ease of installation  
A Documentation  
B Vendor support

### FEATURES

Operating system:	CP/M 2.2
Chip type:	Z-80A
Operating speed:	2 MHz
Memory on card:	0
80-column display:	-
Clock:	-
Z-80 interrupts:	+

### PRODUCT SUMMARY

Microsoft was the company that produced the first Z-80 hard for the Apple. The SoftCard permitted the initial use of CP/M software in the Apple II. The card still stands up well against the current crop of standard Z-80 cards.

Installation, like that of most Z-80 coprocessors, consists of merely putting the card in a slot. The card comes with the CP/M 80 operating system, which consists of the standard CP/M utilities plus special utilities for the Apple. These Apple utilities include a file transfer program, which permits transfer of files from the Apple DOS 3.3 disk environment to the CP/M disk environment. Unfortunately, there is no reverse transfer program offered with the disk, although there are some commercially available and public domain reverse transfer programs. Other "standard" CP/M features included are an 8080 assembler and debugger.

The SoftCard comes with a version of Microsoft BASIC which runs under CP/M.



Actually, there are two versions of BASIC included: MBASIC (semistandard Microsoft BASIC) and GBASIC (which contains all the commands of MBASIC plus Apple high-resolution graphics commands). Additional programming language features available in Microsoft BASIC, which are lacking in AppleSoft, include PRINT USING, WHILE/WEND, IF-THEN-ELSE, and up to 16 digit (double-precision) variables. A compiler for Microsoft BASIC is available at extra cost.

Documentation consists of two manuals. The quality is generally excellent. In addition, there is a book on CP/M, with special consideration given for Apple users, included with the package.

Microsoft covers the SoftCard II with a 1-year warranty. The SoftCard II works with the Apple II, II+, and IIe.

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## **Z Engine**

**\$199.00**

Advanced Logic Systems

### **RATINGS**

B Overall rating  
A Price/performance  
B Software compatibility  
A Ease of installation  
B Documentation  
B Vendor support

### **FEATURES**

Operating system:	CP/M 2.2
Chip type:	Z-80A
Operating speed:	4 MHz
Memory on card:	0
80-column display:	-
Clock:	-
Z-80 interrupts:	+

### **PRODUCT SUMMARY**

This is a CP/M 2.2 card that is functionally equivalent to the Microsoft Soft-card II. It runs on the Apple II, II+, and IIe with either 48K or 64K of memory. It features a hello menu on a cold boot, a nice feature for the inexperienced user.

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## **Z-80 Plus**

**\$139.00**

Applied Engineering

### **RATINGS**

B Overall rating  
A Price/performance  
B Software compatibility  
A Ease of installation  
B Documentation  
B Vendor support

### **FEATURES**

Operating system:	Custom
Chip type:	Z-80A
Operating speed:	4 MHz
Memory on card:	0
80-column display:	-
Clock:	-
Z-80 interrupts:	+

## PRODUCT SUMMARY

The Z-80 Plus comes with its own operating system, not licensed by Digital Research. Previously the card came with no software. The new operating system, tentatively called CP/M 4.0, will support disk operations in a manner similar to the CP/M operating system. Applied Engineering claims that it works with the bulk of CP/M software available including WordStar, dBase II, and Turbo Pascal. The system also supports a RAM disk if you have an extended memory card in your Apple. It will also read the time and date from a clock card and date and time stamp your files.

The card comes with a 3-year warranty and runs on the Apple II, II+, and IIe.

## WORKSHEET FOR Z-80 COPROCESSORS

### PRODUCT

\$ .

### MANUFACTURER

### RATINGS

Overall rating  
Price/performance  
Software compatibility  
Ease of installation  
Documentation  
Vendor support

### FEATURES

Operating system:  
Chip type:  
Operating speed:  
Memory on card:  
80-column display:  
Clock:  
Z-80 interrupts:

## PRODUCT SUMMARY

Table 19-1. Comparative Ratings for Z-80 Coprocessors.

DEVICE	PRICE	RATINGS					
		1	2	3	4	5	6
ALS CP/M Card	\$ 399.00	B	B	A	A	B	B
Appli-Card	4 MHz— 295.00	B	B	B	A	B	B
	6 MHz— 375.00	B	B	B	A	B	B
CP/M Gold Card	64K — 495.00	B	B	A	B	B	B
	192K— 775.00	B	B	A	B	B	B
E-Z Card	60.00	B	A	C	A	B	B
Premium Softcard IIe	495.00	B	B	B	A	A	B
Softcard II	225.00	B	B	B	A	A	B
Z Engine	199.00	B	A	B	A	B	B
Z-80 Plus	139.00	B	A	B	A	B	A
KEY TO RATINGS							
1—Overall rating		4—Ease of installation					
2—Price/performance		5—Documentation					
3—Software compatibility		6—Vendor Support					

Table 19-2. Comparative Features for Z-80 Coprocessors.

DEVICE	FEATURES						
	1	2	3	4	5	6	7
ALS CP/M Card	CP/M 3.0	Z-80B	6 MHz	64K	-	+	+
Appli-Card	CP/M 2.2	Z-80A/	4 MHz/	64K	-	-	-
		Z-80B	6 MHz				
CP/M Gold Card	CP/M 3.0	Z-80B	6 MHz	64K/	+	+	+
				192K			
E-Z Card	None	Z-80A	4 MHz	OK	-	-	-
Premium SoftCard //e	CP/M 2.2	Z-80A	6 MHz	64K	+	-	-
Softcard II	CP/M 2.2	Z-80A	2 MHz	OK	-	-	+
Z Engine	CP/M 2.2	Z-80A	4 MHz	OK	-	-	+
Z-80 Plus	Custom	Z-80A	4 MHz	OK	-	-	+
KEY TO FEATURES							
1—Operating system	5—80-column display						
2—Chip type	6—Clock						
3—Operating speed	7—Z-80 interrupts						
4—Memory on card							

# Chapter 20



## Specialized Peripherals

In the preceding chapters we have covered the “meat and potatoes” of Apple expansion. Interfaces, printers, disk drives, monitors, and modems are the major expensive items that nearly all Apple owners will consider adding to their computers. Beyond these major expansion devices lies a whole world of highly specialized peripherals. They are so diverse in their nature and uses that we will describe them briefly in the sections that follow, and then list all of the reviews in alphabetical order. The table at the end of the chapter will summarize the ratings for all of the products for quick comparison.

### **BUFFERS**

A buffer is mainly used with printers. It can, however, also be used with modems, other printing devices such as typesetting equipment and plotters, or any device which uses a serial RS-232C interface.

The purpose of a buffer is to accept data from the computer and hold it for printing, allowing the computer to be used for other projects. Since the printer takes more time to print out information than it takes the compute to transmit it, the buffer could save you a lot of waiting.

Some buffers perform other tasks, such as merging, rearranging material, copy counting, etc. Some buffers hold more material than others.

### **CONTROLLER/BUFFERS**

A controller/buffer is a stand-alone unit which serves two purposes. As a con-

troller, it automatically directs the transmission of data to one or more specified peripherals such as printers, modems, and terminals, in an orderly fashion. As a buffer, it holds data from the computer until the printer or other peripheral is ready to accept it, which frees the computer for other tasks instead of waiting on the slow printer to finish printing. In most units, the amount of buffer space can be expanded to suit your needs.

## PLOTTERS

With appropriate software, plotters provide high-quality and, frequently, multicolored graphs in the form of drawings, bar charts, pie charts, schematics, etc. with appropriate software. Because many of the dot-matrix printers now available include the ability to do good-quality graphics presentation, the use of plotters has declined, except for very special applications.

## POWER PROTECTION DEVICES

The consistency of power supplied by the utility companies is inadequate and often unsafe for the normal requirements of today's memory-based electronic equipment. Lightning strikes, startup of power equipment in the neighborhood, and the operations of air conditioners or refrigerators can cause sudden voltage increases. They can actually damage and deteriorate the microprocessor, and even alter or erase stored data. *Line noise*, which is the interference caused by the operation of small electrical appliances, can also have harmful effects upon the data. Two major studies of power disturbances (one in 1974 by IBM and another in 1981 by Bell Laboratories) divided these disturbances into the follow categories:

Noise to 200V peak	83 + %
Noise greater than 200V peak	1 + %
Sags greater than 20%	13%
Surges greater than + 10%	1%
Blackouts	2 + %

These studies indicated that some type of power fluctuation sufficient to shut down the computer occurs approximately 62 times a year—a little over once a week. To some computer users, these protection devices are not considered a luxury item when you consider loss of valuable data and the cost to repair the damage done to the system.

Various products on the market provide protection against some (or all in the case of the UPS) of these conditions. The units plug directly into wall outlets, and then the power plug of the computer is plugged into the unit.

*Transient surge suppressors* are an inexpensive way to suppress noise or voltage surges when they exceed a preset level (usually 200 to 300 volts for a 120-volt line). High-frequency noise suppression depends on the response time of each particular model.

*Super isolation transformers* are specifically designed to eliminate common-mode

noise, which is the most prevalent power line problem. They provide no protection against surges or sags in power, however.

*Voltage regulations* are nonisolated devices which make a correction for power sags and surges. They do not, however, remove the line noise.

*Ac line conditioners* weaken both common-mode and transverse-mode noise, while regulating the voltage. While some ac line conditions claim to be true, they do not actually filter out the noise.

*Standby systems* (sometimes called off-line UPS) switch in only when the power fails, or when the line voltage goes very low. They will protect you against blackouts, and they consist of an inverter, a battery, a battery charger, a power monitor, and a high-speed transfer switch. Off-line systems cost much less to produce because they do not require a high-powered battery charger. Because it is off-line, it does not use continual power like the on-line UPS.

The main factor to consider is their switching or transfer time. The new technology on high-speed transfer switches cuts the transfer time down to 4 milliseconds. Other important features to consider are output waveshape, which will affect the computer's performance. Look for the best quality of either sine-wave or square-wave output. Many units are square-wave outputs, which most equipment cannot tolerate for too long.

Backup time is also important and will vary with different units. Studies show power outages and fluctuations will last from 6 seconds or less (about 50 percent) to 10 minutes (about 90percent). You are mainly looking for enough time to finish current work and shut down the computer. Battery recovery time should also be considered. Most batteries can be brought to 85 percent of full capacity within 2 to 3 hours. Cost is always a factor, and a good guideline is a unit costing 10 percent of the cost of the system to be protected.

*UPS*, or uninterruptible power systems, are on-line, and provide protection against power failures. They also act as ac line conditioners. They can be quite expensive. A typical on-line unit consists of a rectifier/battery charger, an inverter, a battery, a power monitor, and a bypass transfer switch. Since it is always on, it is continually using power, which adds to its cost, and while it is on it heats up, which creates the need for a cooling system, another cost.

## SECURITY

It is hard to believe that theft, manipulation, and vandalism of computer data amounts to some \$3 billion every year. Information is sold to competitors, totally destroyed, altered, or in some cases ransomed back to the original owner. There are currently no federal statutes covering this area, and the few states with statutes are confusing or totally ineffective. Crimes include credit card scams, illegal bank fund transfers, payroll record tampering, and theft of such things as product designs, research data, marketing plans, customer lists, privileged client information, etc.

Some systems using a common password, or those featuring call-back protection can be tampered with through transmission lines or by gaining access to the codes. Other systems are based on the Federal Data Encryption Standard, a very sophisticated approach for protecting both stored and transmitted data. The National

Bureau of Standards recommends four methods which are software-selectable: Electronic Code Book, Cipher Feedback, Cipher Block Chaining, and Output Feedback. For more detailed information, ask for the Federal Information Publication #46.

---

## Angel Buffer

\$295.00

Ligo Research, Inc.

### RATINGS

- A Overall rating
- B Price/performance
- A Ease of installation
- A Documentation
- A Vendor support

### PRODUCT SUMMARY

Angel, the Intelligent Buffer (Fig. 20-1), has the standard 64K RAM of dynamic memory. It uses either the RS-232C serial or Centronics-type parallel interface. There are eight white squares (membranes) to Clear, Copy, Page Skip, Page Re-Print, Function, Second Function, Hold, and Pause, which allow you to perform 12 different functions.

*Clear* is used for the page mode, which continually checks the page break data while printing and allows you to reprint the last page, any jammed pages, skip pages,



Fig. 20-1. The Angel will work with most of the popular printers available for the Apple (courtesy of Ligo Research, Inc.).

and pause for single sheet feeding. Also use Clear for soft-reset, self-test, and space compression, which extends the buffer capacity to more than 128K.

*Copy* allows for multicopy, continuous copy, hex dump, and memory test.

*Page Skip* allows for page pause, skip data for partial printouts, page definition, and version.

*Page Re-Print* allows for multireprint, restoring the buffer, and two "reserved" spaces.

*Function* is used for select function. Second Function also allows for the display of the available buffer.

*Hold* displays transmit pointer.

*Pause* enables multikey functions.

Six LED indicators display the status and activities of the buffer: Power on, space compression, page mode, page-pause, stop receiving, and stop sending.

The bar in the lower left-hand side contains three easily accessible, eight-position switches to select the device type, baud rate, and input/output. Installation consists of connecting the cables, setting up DIP switches, and turning on the power. There is a 13-page technical supplement and compatibility chart indicating the cables necessary for connecting various systems.

The Angel is compatible with printers made by Epson, Centronics, Diablo, NEC, C. Itoh, Okidata, Qume, Toshiba, Smith-Corona, Transtar, and most other printers featuring the RS-232C serial or Centronics-type parallel interfaces. Baud rates vary and range from 110 to 19.2K.

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## Datasaver Standby Power System

200 watt—\$495.00

Cuesta Systems, Inc.

### RATINGS

- A Overall rating
- A Price/performance
- A Ease of installation
- A Documentation
- A Vendor support

### PRODUCT SUMMARY

The Datasaver (Fig. 20-2) prevents the accidental loss of data which may be caused by an interruption in the normal power supply by automatically switching to its internal power within 1/100 of a second. It can also be used as a portable power supply by plugging an external 12-volt battery (car, van, motorhome, boat, plane, etc.) into the appropriate jacks in the rear. The internal, rechargeable battery on this unit provides from 5 to 15 minutes of operating time, depending on whether you are operating at full- or half-rated output power.

There are audible and visual alarms, as well as an interrupt signal to indicate when the normal power supply has been interrupted and the Datasaver has taken





Fig. 20-2. The Datasaver can prevent accidental loss of your valuable data (courtesy of Cuesta Systems, Inc.).

over. The unit is small and fits easily on the desktop. There is no installation since the Datasaver plugs into an ac power receptacle, and the computer is plugged into it.

The Datasaver meets all UL, FCC, and CSA standards and has a 1-year limited warranty.

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## **DataShield Model 100 Surge Protector**

\$89.95

PTI Industries

### **RATINGS**

B Overall rating

B Price/performance

A Ease of installation

B Documentation

C Vendor support

### **PRODUCT SUMMARY**

The DataShield Model 100 surge protector will eliminate voltage surges and will filter noise that can damage the computer or the peripherals. It has six outlets for plugging in the computer and up to five other devices. Two of the six sockets

are devoted to superfiltration for extra-sensitive equipment. The wall power enters the DataShield and passes through circuitry which filters the voltage before it reaches the computer's receptacles. A light signal and a buzzer alert you to a brownout, when voltage drops to levels below 100 volts and has a reset button to guard against excessive voltage surges upon return of power. An unlit LED indicates this reset button must be pressed. Response time for surge protection is 0.1 nanoseconds. Noise is attenuated from -20dB to -100dB, and noise protection ranges from 100 KHz to 300 MHz.

The unit is warranted for 6 months and can handle large power demands from a monitor, printer, etc.

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## **DataShield Backup Power System**

PC-200—\$359.00

PTI Industries

XT-300—\$499.00

### **RATINGS**

B Overall rating

B Price/performance

A Ease of installation

A Documentation

B Vendor support

### **PRODUCT SUMMARY**

The DataShield Backup Power sources are battery-operated auxiliary generators. There is also a built-in surge protector. These features protect you against a total blackout or power surges above 140 volts. The unit filters out the line noise from appliances. When the power falls below 108 volts, the system switches over to the battery. On the PC-200 (Fig. 20-3) this occurs within 10 milliseconds, and on the XT-300 (Fig. 20-4) it occurs within 4 milliseconds. When you are operating a full load you have 5 minutes of backup power, and at half load you have 20 minutes of backup power.

The surge protection operates continuously to guard against any harmful surges. A flashing light indicates that the battery is running low and needs to be recharged. The battery has a long life (4 years) and requires 10 to 12 hours to recharge.

The PC-200 (at 200 watts output) is ideal for the Apple with monitor, which requires less than 200 watts. The XT-300 (at 300 watts output) is designed for hard disk drives. Both of these models are FCC-approved for safety. There is a 6-months warranty on parts and labor.



Fig. 20-3. The PC-200 is a battery-powered backup power source (courtesy of PTI Industries).



Fig. 20-4. The XT-300 will provide immediate backup power in the event of a failure (courtesy of PTI Industries).

# DES 2000 Security System

\$459.00

## Practical Peripherals

### RATINGS

B Overall rating

B Price/performance

A Ease of installation

B Documentation

A Vendor support

### PRODUCT SUMMARY

This system is designed to protect your data—accounting records, product design data, research data, marketing plans, customer lists, privileged client data, bank files, credit information, etc.—from theft, manipulation, or vandalism. Sixteen-digit “keys” are used to encrypt and decrypt, and there are 72 quadrillion possible combinations. These keys are not lost when the power is turned off. The DES 2000 is based on the Data Encryption Standard (a complex ciphering algorithm) set by the Federal Government and endorsed by the American Bankers Association.

With the DES 2000, your data is protected from intrusion via a modem, phone line, or disk. You will need an RS-232C-compatible communication link and two units—one for encrypting from the host computer and one for decrypting at the receiving end.

The Local Mode protects stored data, and the Communication Mode protects transmitted data. The Local Mode encrypts and decrypts disks for storage or transportation. Using software, the disks can be edited in their encrypted state or decrypted at the beginning of the work session.

For the Communication Mode, four keys are needed to gain access to the system. The Single Session Key is known and entered by only one individual into all units in the communication link. The Master Key/Encrypted Session Key combination consists of entry of the Master Key first, known and entered by a corporate officer, then the data processing person enters the Encrypted Session Key. The Auto-Transfer Encrypted Session Key is used when the Encrypted Session Key needs to be entered into a number of units, by automatically entering the key using communication lines. The Auto-Load Secret Session Key allows work to be done on specific files which need Individual Keys and ID Codes entered before files can be accessed, by entering these keys automatically.

The front panel has four touch-sensitive switches—one for Reset, in case of errors created by electrical problems; Cipher, used for encrypting and decrypting; Local, to switch operation to the Local Mode; and Menu, which gives you a command menu for setting up keys and the system. LEDs over the Cipher and Local switches indicate activity. There is also an LED to indicate power is on.

The DES 2000 has a 5-year warranty on parts and labor and meets all requirements for encrypting set by the National Bureau of Standards.

## **DMP-29 Plotter**

**\$2295.00**

Houston Instrument

### **RATINGS**

- A Overall rating
- B Price/performance
- A Ease of installation
- B Documentation
- A Vendor support

### **PRODUCT SUMMARY**

The DMP-29 is an eight-pen plotter which produces either 8.5- $\times$ -11-inch or 11- $\times$ -17-inch copies on heavy bond, vellum, or film paper. This unit is compatible with most graphics software, allowing you to create graphs, charts, technical drawings, medical drawings, architectural drawings, and maps.

With the DM/PL, Houston Instrument's plotter language, you can create eight sets of characters (including European), at any of 360 possible angles and in 255 sizes. The DMP-29 will not only draw solid lines or any combination of dots and dashes automatically, but it will also plot only a section of the entire presentation, or scale too-large or too-small plots down or up to size.

The DMP-29 performs quickly (22 inches per second) and quietly (less than 60 dBm).

The firmware includes all commands supported by the DM/PL. Character sets include slant (italics), 93 upper; and lowercase characters, 8 character sets (including European), and 255 possible character heights at any angle. The character width is selectable independent of the height and defaults to 86 percent of the height. The front panel includes touch-sensitive buttons for power on/off, home, load, X- and Y-axis deadzone test pattern, large and small X pattern for dynamic balancing, stairstep pattern for linearity testing, and self-test and ROM/RAM diagnostics. Arrow buttons control pen movement.

Connection to your computer is by RS-232C serial, Centronics-type parallel, or GPIB interface.

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## **DMP-40 Plotter**

**\$995.00**

Houston Instrument

### **RATINGS**

- A Overall rating
- A Price/performance
- A Ease of installation
- B Documentation
- A Vendor support

## PRODUCT SUMMARY

This is a single-pen plotter which allows you to create graphics on 8 1/2- x -11-inch or 11- x -17-inch bond, vellum, or mylar paper. By using the pause command, provided with most software, you are able to change the pen to another color. Circle, ellipses, arcs, and curves are easily drawn, and tracing is done by plotting in increments of only 0.005 inches.

The standard plotter hard nib pen is used, or you can use a ball point or film ink pen. Black, red, blue, and green colors are included.

The front panel includes touch-sensitive buttons for controlling small or large paper size, local movement of the pen with four arrow buttons, scaling, baud rate, addressability, self-test, and clipping or windowing. The Draw Commands include vector generation, absolute or relative, arc generation, circle generation, ellipse generation, and curve fit generation. The Text Commands include Print Mode, 93 upper- and lowercase characters, variable height, rotation and aspect ratio, italics, and special centered markers. Control Commands include English or Metric, report back, query plotter identification, windowing, viewport with scaling, internal self-test, handshaking, and velocity.

The DMP-40 weighs about 10.5 pounds, and is 4.4 inches high by 21.2 inches wide by 8.0 inches deep. The standard RS-232C interface allows you to connect this plotter to your computer.

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## Interfazer Controller/Buffer

16K—\$195.00

Quadram Corporation

64K— 295.00

## RATINGS

B Overall rating

B Price/performance

B Ease of installation

B Documentation

A Vendor support

## PRODUCT SUMMARY

The Interfazer serves two functions. As a buffer, it stores data and then transmits it to one printer at a time. As a controller, it is designed to keep data flowing from either one or eight computers and send this data to one or more specific printers. This is accomplished on a first in-first out basis. There are LEDs on the front panel to indicate the status of the activity and error messages.

The Interfazer helps to eliminate problems with peripherals before they arise and also serves as an incompatible device interface, computer I/O expander, data transfer rate converter, and additional peripheral buffer.

There is one version with a 16K RAM installed and another with 64K RAM. The parallel and serial input cards are available for \$65 each.

With the Interfazer you are able to use two printers simultaneously without any

mechanical changes. It uses an 8085 microprocessor with eight slots for I/O cards and two slots each for 64K RAM.

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## **Lemon/Lime/Peach/Orange Surge Protectors**

EPD, Inc.

Lemon—\$ 59.95  
Lime—\$ 89.50  
Peach—\$ 97.50  
Orange—\$139.95

### **RATINGS**

A Overall rating  
B Price/performance  
A Ease of installation  
B Documentation  
B Vendor support

### **PRODUCT SUMMARY**

The Lemon, Lime, Peach, and Orange are good-quality surge protectors from EPD, Inc. They represent a small expense to protect your increasingly valuable complex of computer peripherals, all of which are subject to damage by power surges. Line filtering also helps prevent interference between any pair of devices. Many “mysterious” hardware problems go away when a filtering surge protector is used with the system.

The Lemon attaches directly into the wall socket and has six plug receptacles. The Lime sits on the floor, has a power cord to plug into the wall socket and has six plug receptacles.

The Peach and the Orange surge protectors feature line filtering. The Peach attaches directly to the wall and has three receptacles. The Orange is a floor model and has six receptacles. The Orange has a response time of 5.0 nanoseconds to power surges. It attenuates noise from -5dBs to -58dBs and protects against noise at frequencies ranging from 150KHz to 30MHz.

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## **The MAX SS/2 Surge Protector**

\$79.00

Panamax

### **RATINGS**

B Overall rating  
B Price/performance  
A Ease of installation  
B Documentation  
B Vendor support

## PRODUCT SUMMARY

Panamax has a whole line of good-quality surge protectors. The MAX SS/2 has two plug receptacles, plugs directly into the wall socket, and protects against power surges and noise interference. Some of the other surge protectors from Panamax include UltraMax, with four plug receptacles, a power cord to plug into the socket, on/off switch, brown out protection, circuit breaker, and undervoltage alarm (\$159.00); SS/6 LCS, with six plug receptacles, on/off switch, circuit breaker, and a power cord to plug into the socket (\$119.00); and TeleMAX, with one plug receptacle and two phone jack hook-ups (\$89.00). All of the units come with a 5-year warranty.

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### Microbuffer/E Buffer Interface Cord

Practical Peripherals

8K—\$159.00  
16K— 179.00  
32K— 219.00  
64K— 279.00

### RATINGS

A Overall rating  
B Price/performance  
B Ease of installation  
A Documentation  
A Vendor support

## PRODUCT SUMMARY

The Microbuffer/E is designed specifically for Epson printers. It is inserted inside all of the Epson printers. Since the Epson prints at 80 to 160 cps, it takes about 2.5 to 5 minutes to print 16,000 characters. With the Microbuffer/E, the 16,000 characters are sent in seconds.

There are six models—three each for parallel and serial interfaces. MBS models indicate serial interface, and MBP models indicate parallel interface. The MBS-16K can be expanded to 32K by adding RAM chips, and the MBS-32 can be expanded to 64K by adding the Memory Expansion Module (\$89). The MBS-8K with 8,192 bytes of data storage can easily be interfaced to almost any RS-232C device with hardware or software handshaking. The MBS-32/64K with up to 65,536 bytes of data adds the ETX/ACK handshaking to the standard XON/XOFF. The MBP-32K (\$199) can be expanded to 64K using RAM chips. \$279.00.

These units are easily installed. They come with a 5-year warranty on parts and labor.



## **Microbuffer In-Line Buffer**

32K—\$299.00

Practical Peripherals

64K—\$349.00

### **RATINGS**

B Overall rating

C Price/performance

A Ease of installation

A Documentation

A Vendor support

### **PRODUCT SUMMARY**

The Microbuffer In-Line Buffer is available in two versions, either serial (MBIS) or parallel (MBIP). The MBIS-32K and MBIP-32K can be expanded to 64K with RAM chips, then further expanded in 64K increments up to 256K by using the Memory Expansion Modules (\$179). The MBIS-64K and MBIP-64K can also be expanded in this fashion.

These are stand-alone buffers, require no modifications of software, and are easily installed with almost any computer. Data is transferred at the rate of approximately 4000 cps. Multiple copies may be made, and printing may be interrupted at any time using the pause control. Another feature allows you to turn off your computer while the printer continues printing.

The MBIP and MBIS feature a touch-sensitive front panel for controlling the clear function, the copy function, and the pause function. LEDs indicate which activity is in use and also when the power is on.

The MBIS has the added pass control, which buffers data coming in to the computer to reduce expensive modem transmission time or when incoming data arrives faster than the computer can process it.

The units are easily installed, and there is a 5-year warranty on parts and labor. The connector cable is included.

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## **Microfazer Buffer**

\$169.00

Quadram Corporation

\$1395.00

### **RATINGS**

B Overall rating

B Price/performance

A Ease of installation

B Documentation

A Vendor support

### **PRODUCT SUMMARY**

The Microfazer (Fig. 20-5) is a universal printer buffer which can also be used



Fig. 20-5. The Microfazer buffer is available in several memory configurations, including 256K and 512K (courtesy of Quadram Corporation).

with plotters and even modems. The pause/copy feature allows you to print additional copies of the material in the buffer by pushing a button on the front panel. There is also a reset switch to set the Microfazer and clear the memory. LEDs located on the front panel indicate ready, error status confirmation, and the pause/copy mode.

The Microfazer has a variety of memory sizes and adapts to any type of connection. There is a snap-on parallel unit which does not have the pause/copy feature for the Epson MX printer available with a memory of 8K (\$169), 16K (\$189), and 64K (\$299). Parallel-to-parallel versions are available with 8K (\$179), 16K (\$199), 64K (\$299), 256K (\$895), 512K (\$1395), and two RAM expansion cards—128K (\$445) and 384K (\$950). The 512K memory is equal to over 250 typed, letter-size pages.

Serial-to-parallel, serial-to-serial, and parallel-to-serial versions are also available in 8K (\$199), 16K (\$220), and 64K (\$330). You could use the serial-to-parallel version if you need to use your computer's serial port to connect a printer with a parallel interface, or vice versa.

The Microfazer is small, compact, and enclosed in a durable metal case. Some models plug directly inside or onto the back of the printer.

Quadram also makes the Efazer, which installs directly inside the Epson MX or FX. This version is available with 8K (\$99) and 64K (\$199).

## **Micro-UPS, Model 3056**

\$1995.00

RTE DELTEC Corporation

### **RATINGS**

C Overall rating  
C Price/performance  
C Ease of installation  
A Documentation  
A Vendor support

### **PRODUCT SUMMARY**

This on-line UPS provides continual voltage regulation and noise elimination to personal computers. It also provides a battery reserve for complete power outages. The internal 10-minute battery included in the purchase price can also be used with external 48-volt batteries for extended periods. Unlike other power supplies, there is no switching when the power changes or fails completely, because the battery is already on-line. In the event of internal failure, a bypass switch transfers the load to the input or utility line. The 10-minute internal reserve time may be lengthened to 1 hour with the optional battery pack.

RTE DELTEC offers a 1-year warranty on materials and workmanship.

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## **Minicomputer Regulator Super Isolation Transformers**

Sola Electric

60 Hz—\$169.40 and up  
50 Hz—\$228.60 and up  
Hard-wired— 202.57 and up

### **RATINGS**

B Overall rating  
B Price/performance  
A Ease of installation  
B Documentation  
A Vendor support

### **PRODUCT SUMMARY**

The Minicomputer Regulator series comes in three models—the 60Hz single phase (portable) model, the 50Hz single phase (portable) model, and the 60Hz single phase (hard-wired) model. All models are UL listed.

These regulators are designed to detect and correct both transverse- and common-mode noise. They suppress transients and protect the equipment from overloads, brownouts, and other line voltage fluctuations. The waveshape output is sine wave. The two portable models have an input off/on switch. Common noise is rejected at 120dB and transverse noise at 60dB.

The portable models plug into the wall, and the hard-wired models are designed to be mounted on the wall.

Sola recently came out with a rack-mount version of this unit (\$826.85) designed for applications where rack-mounting is more convenient. These units are approximately  $9.81 \times 19 \times 10.46$  inches. Rack-mount models feature input/output voltmeters, output current ammeters, four output circuit breakers to protect the unit from overload, two 15-amp output receptacles, and a heavy-duty cord. The indicator light and power switch are located on the front panel.

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## Mini UPS

60 Hz—\$1665.00

Sola Electric

### RATINGS

- B Overall rating
- C Price/performance
- A Ease of installation
- B Documentation
- A Vendor support

### PRODUCT SUMMARY

The Mini UPS is a portable on-line unit which continuously supplies power. It uses a long-life, maintenance-free battery which is built into the unit. The Mini UPS also regulates the output voltage and protects the load from noise, line interference, and brownout conditions. The Mini UPS uses a single-phase 120 Vac input and is available in 60 Hz with either a 400 VA output or a 750 VA model, which is UL approved. There is also a 600-VA, 50-Hz unit (\$1950).

The output waveshape is a sine wave. If the Mini UPS is operated at less than full load, the battery backup time will be extended. If operated at full load, there are optional battery packs available if more backup time is needed.

The Mini UPS features an automatic shut-off circuit which disconnects the battery during prolonged power outages to prevent damage to the battery. When regular power is restored, the battery is automatically recharged to 95 percent of its capacity in less than 10 times the discharge time. This process is done without operator assistance.

The on/off switch on the front panel controls the inverter. The battery will continue charging when the unit is turned off. Lights on the front panel indicate that the inverter is on, the charger is on, and the line power is operating.

There are two other models available in this series—the Deluxe model (\$2180) which features automatic inverter restart to allow the inverter to restart once the normal power is restored following a shutdown from a discharged battery. A battery supplying power to the alarm circuit indicates that the inverter is being powered by the battery when the power fails. The High Inrush Current models (\$2415) supply up to six times the rated current for very short durations. They are usually used for applications requiring large inrush currents.

## **Multiport Controller/Buffer Model 524**

**\$279.00**

Bay Technical Associates, Inc.

### **RATINGS**

- B Overall rating
- B Price/performance
- B Ease of installation
- B Documentation
- B Vendor support

### **PRODUCT SUMMARY**

The Multiport Controller is a stand-alone unit designed to control and buffer data between the computer and peripherals such as a printer, modem, and terminal. The 524 has a port for the computer and four peripheral ports. A specific port is selected from the computer with the Control-T plus the port number, and the computer remains connected to that port until another selection is made.

The four ports each have buffers for receiving and transmitting. The size of the buffer depends on the model chosen. Since the 524 is a basic unit, there is an option for a 256-byte buffer.

A Configuration Mode is available with a Control-R and the port number. The 524 then gives the current port's configuration and a menu, which allows you to quit, set baud rate, set word size, set stop bits, and set parity.

Options for the 524 include Custom Power-Up Default to automatically power-up to a specific, factory-set configuration. Custom Control Character allows you to order specific characters to control your 524. Connector Options allow you to order DTE (data terminal equipment) ports instead of the standard DCE (data communication equipment) ports. You can order 220 volts instead of the standard 115 Vac. XON/XOFF allows you to use either hardware- or software-handshaking protocol and includes 256-byte buffers for each peripheral port.

Other models in the multiport controller series include the 524D series (\$319), which provides one to four devices with access to a single device through a common port. These models have the 524 options plus Port I.D. Characters for sending two characters and to identify the last port which signed on. One to 28-Minute Timeout allows for automatic disconnection when no activity has occurred in that amount of time. You can change the amount for the time through software. Host Port Control controls the host port.

The 524E series (\$319) is a statistical multiplexer and usually sold in pairs, which allows four lines of data to be simultaneously sent over one line and demultiplexed by the second unit. The data is automatically distributed to the corresponding peripheral ports. The same options are available for the 524.

The 524F Model (\$329) allows for any-port-to-any-port interconnection. The applications are unlimited with this unit, and the same options are available as with the 524.

There is a 1-year warranty on all these units. They weigh about 5 pounds and are approximately 8 inches wide by 7.5 inches deep by 2.25 inches high.

## Power Line Monitor

\$303.00

Sola Electric

with printer \$964.00

### RATINGS

- B Overall rating
- C Price/performance
- A Ease of installation
- B Documentation
- A Vendor support

### PRODUCT SUMMARY

The Power Line Monitor (Fig. 20-6) is used to determine the cause of power problems. Sola Electric makes five models, three of which print out information on the type of disturbance and the date and time of the occurrence. The printing monitors also check on low-line frequency, while the deluxe printing model (\$2390) provides information on temperature and the load's dc power supply.

These units could be of assistance to you in determining typical power problems in your environment before you purchase a power conditioner for your system. An audible alarm sounds when a problem occurs. A chart on the unit provides information on typical power problems, their possible causes, and the type of equipment needed to solve the problem. The typical power problems covered include power

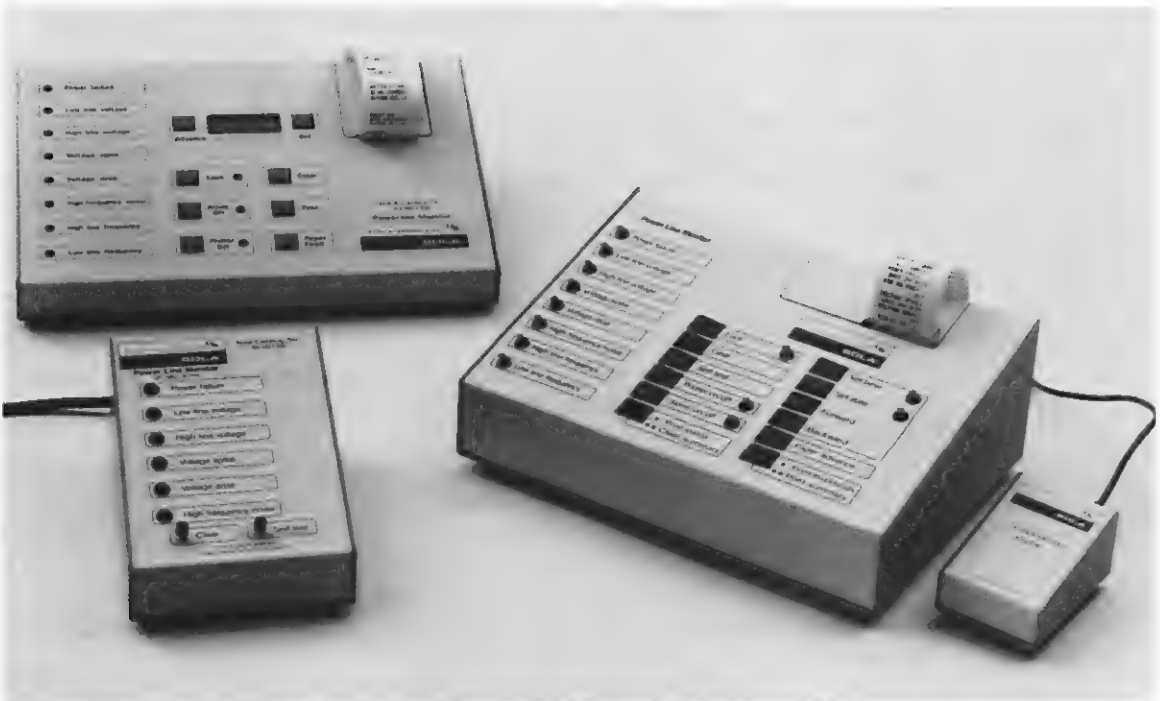


Fig. 20-6. The Power Line Monitor will detect a number of typical power problems (courtesy of Sola Electric).

failure, low line voltage, high line voltage, voltage spike, voltage drop, high frequency noise, high line frequency, and low line frequency.

The two nonprinting models feature six LEDs which indicate which problem is occurring. They do not include information on high or low line frequency. There is a button for clear and another for test. The unit itself is 3 × 5 × 7 inches and weighs about 2 pounds.

The printing models feature eight LEDs to indicate the cause of the power problem, and three LEDs to indicate the status of the audible alarm, the printer, and the external alarm contacts. Control buttons allow you to clear, test or lock the unit, advance the paper, advance and set the clock, and turn off the alarm and the printer.

The deluxe printing model (#80-006-60) further features control buttons for print status/clear summary, print thresholds/print summary, and to move the clock backwards in time. A row of DIP switches are included to set the power failure/power restore thresholds, the line frequency tolerance, and the 120/240-volt operation. There are two single switches to set the temperature and the volt line operation. The small temperature probe sits alongside the monitor. These printing models are approximately 11 × 3 × 3 inches and weigh about 6 1/2 pounds.

All of these models are completely portable. They are easily plugged into any wall outlet.

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## Powermaker Micro UPS

\$ 820.00-\$1195.00

Topaz, Inc.

### RATINGS

B Overall rating

A Price/performance

A Ease of installation

B Documentation

B Vendor support

### PRODUCT SUMMARY

Topaz makes a number of different models in this price range, and different models reflect the voltage (120 or 220), the amount of standby power provided, and the length of time the unit will run on its internal battery. Several models feature a signal to the computer to shut down while unattended. This signal is called a *status monitor*.

All models feature maintenance-free batteries which take about 16 hours to recharge. There is overload and short-circuit protection, and the low-battery sensor prevents the batteries from discharging beyond their capacity. There is a beeper to alert you when the power has failed; however there is no way to tell when the battery is low. Noise attenuation begins at 10kHz; 40dB minimum at 100kHz and above.

Typical backup time, depending on the model, ranges from 9 minutes (full load) to 30 minutes (half load), 12 minutes to 35 minutes, and 35 minutes to 75 minutes of sine wave output.

Typical transfer time from power line to inverter is 4 milliseconds (10 ms. maximum). From inverter to power lines, the time is 2 milliseconds (4 ms. maximum). The 60Hz (120v) models are UL approved for safety.

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## SC14 Signal AC Line Conditioner

Interactive Structures, Inc.

1-channel—\$ 44.00  
4-channel— 255.00  
16-channel— 440.00

### RATINGS

B Overall rating  
B Price/performance  
B Ease of installation  
C Documentation  
B Vendor support

### PRODUCT SUMMARY

The SC14 series is intended to extend analog input systems. Interactive Structures manufactures two such analog input systems—the AI02 and the AI13. The SC14 is available in 1, 4, or 16 channels.

The channels can be programmed by using the plug-in DIP function modules. Weak or noisy signals are accepted by the SC14 and filtered to improve accuracy of the readings. The signals are output at 0 to 5 volts.

The 1-channel model includes a small circuit card which connects to the input system with a shielded 3-conductor cable. The 4-channel connects to the input system with a 6-foot ribbon cable. The 16-channel model has four 4-channel circuit boards inside a rack-mountable metal case and a 6-foot cable. The inputs and grounds are easily installed.

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## ShuffleBuffer

Interactive Structures, Inc.

32K—\$349.00  
64K— 399.00  
128K— 499.00

### RATINGS

A Overall rating  
A Price/performance  
A Ease of installation  
A Documentation  
A Vendor support

### PRODUCT SUMMARY

The ShuffleBuffer comes in three models, depending on the amount of RAM you need. Control and indicator lights are on the front panel. It is a universal buffer,



and it works with any standard serial or Centronics-type parallel interface. Included with the buffer are the cables, power supply, and a comprehensive manual. Status lights indicate you are in the BYPASS Mode (a steady glow), a memory overflow (a slow flash), or a RAP Mode graphics fillup sequence (a fast flash).

The Random Access Printing (RAP) Mode stores text or pictures to be printed in any order, any number of times. The RAP commands include: create bucket, erase and restart, append, switch sources, enter BYPASS mode, ignore RAP commands, repeat bucket, print bucket, skip bucket, skip sequence, end bucket, end of data, and change lead-in character.

You can also use the standard first in-first out (FIFO) Mode to print without tying up the computer. The third mode, BYPASS, allows you to interrupt a long print from the buffer to print from the computer.

Data compression is automatic and provides for more efficient utilization of the memory. A simple and safe erase feature allows you to erase the buffer memory and enter the mode indicated by the switches. Automatic duplication frees the computer for other tasks while the printer prints up to 254 copies.

The ShuffleBuffer is compatible with any printer with a RS-232C-serial or Centronics-type parallel connector. When ordering this unit, specify your computer and printer brand for the correct cables (which are included).

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## **Spikemaster Surge Protector**

**\$79.95**

Discwasher

### **RATINGS**

- A Overall rating
- A Price/performance
- A Ease of installation
- B Documentation
- A Vendor support

### **PRODUCT SUMMARY**

Spikemaster is a high-quality spike protector and line filter. It is built of heavy-duty components and offers a circuit breaker, five-way filtering, and an on/off switch with indicator light. It can handle a total load of 15 amps, more than enough for a large computer system. Spikemaster is the sturdiest spike-surge protector we have seen, and it works well in areas with a notoriously bad power supply.

## SPS Standby Power Source

\$828.00

Sola Electric

### RATINGS

- B Overall rating
- B Price/performance
- A Ease of installation
- B Documentation
- A Vendor support

### PRODUCT SUMMARY

Sola's SPS is an off-line power system designed to protect the computer against interference on the ac line as well as against power failures. Transfer time from line to inverter is 4 to 10 milliseconds, when the voltage drops below 15 percent. At half load it offers 30 minutes typical reserve time, and at full load it offers 12 minutes. The SPS provides a clean, sine-wave output. Two models offer either 400VA to 800VA (\$983) power.

When the line power is on, the SPS offers protection against noise and other interference, and recharges itself automatically. It also offers inverter overcurrent protection. An alarm sounds to alert the user that it is switching to battery power.

The SPS is 15 inches high, 7 inches wide, and 18.5 inches deep, and the 400VA unit weighs 65 pounds. Both models operate at 60 Hz and are UL-approved for safety. Sola Electric has been in this business for over 50 years and offers technical and installation assistance.

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## WORKSHEET FOR SPECIALIZED PERIPHERALS

### PRODUCT

\$ .

### MANUFACTURER

### RATINGS

- Overall rating
- Price/performance
- Ease of installation
- Documentation
- Vendor support

### PRODUCT SUMMARY

**Table 20-1. Comparative Ratings for Specialized Peripherals.**

DEVICE	TYPE	PRICE	RATINGS				
			1	2	3	4	5
Angel	B	\$295.00	A	B	A	A	A
Datasaver	SPS	495.00	A	A	A	A	A
DataShield Model 100	SP	89.95	B	B	A	B	C
DataShield PC-200	SPS	359.00	B	B	A	A	B
	XT-300 SPS	499.99	B	B	A	A	B
DES 2000 (Data Encryption System)	SS	459.00	B	B	A	B	A
DMP-29	PL	2295.00	A	B	A	B	A
DMP-40	PL	995.00	A	A	A	B	A
Interfazer	16K RAM— C/B	195.00	B	B	B	B	A
	64K RAM— C/B	295.00	B	B	B	B	A
Lemon	SP	59.95	A	B	A	B	B
Lime	SP	89.50	A	B	A	B	B
Peach	SP	97.50	A	B	A	B	B
Orange	SP	139.95	A	B	A	B	B
The MAX SS/2	SP	79.00	B	B	A	B	B
Microbuffer/E	8K RAM— BIC	159.00	A	B	B	A	A
	16K RAM— BIC	179.00	A	B	B	A	A
	32K RAM— BIC	219.00	A	B	B	A	A
	64K RAM— BIC	279.00	A	B	B	A	A
Microbuffer In-Line	32K RAM— B	299.00	B	C	A	A	A
	64K RAM— B	349.00	B	C	A	A	A
Microfazer	8K RAM— B	189.00	B	B	A	B	A
	16K RAM— B	189.00	B	B	A	B	A
	64K RAM— B	299.00	B	B	A	B	A
	256K RAM— B	895.00	B	B	A	B	A
	512K RAM— B	1395.00	B	B	A	B	A
Micro-UPS Model 3056	UPS	1995.00	C	C	C	A	A
Minicomputer Regulators	60 Hz— SIT	169.40	B	B	A	B	A
	50 Hz— SIT	228.60	B	B	A	B	A
	Hard-wired— SIT	202.57	B	B	A	B	A
Mini UPS	UPS	1665.00	B	C	A	B	A
Multiport Controller Model 524	C/B	279.00	B	B	B	B	B
Power Line Monitor	PLM	303.00	B	C	A	B	A
	with printer PLM	964.00	B	C	A	B	A
Powermaker Micro UPS	SPS	820.00	B	A	A	B	B
SC14 Signal Conditioner	1-channel— ACLC	44.00	B	B	B	C	B
	4-channel— ACLC	255.00	B	B	B	C	B
	16-channel— ACLC	440.00	B	B	B	C	B
ShuffleBuffer	32K RAM— B	349.00	A	A	A	A	A
	64K RAM— B	399.00	A	A	A	A	A
	128K RAM— B	499.00	A	A	A	A	A
Spikemaster	SP	79.95	A	A	A	B	A
SPS (Standby Power System)	SPS	828.00	B	B	A	B	A

**KEY TO RATINGS**

1—Overall rating  
2—Price/performance  
3—Ease of installation  
4—Documentation  
5—Vendor support

**KEY OF ABBREVIATIONS**

ACLC—AC Line Conditioner  
B—Buffer  
BIC—Buffer Interface Card  
C/B—Controlled/Buffer  
PL—Plotter  
PLM—Power Line Monitor

SIT—Super Isolation Transformer  
SS—Security System  
SP—Surge Protector  
SPB—Standby Power System  
UPS—Uninterrupted Power System

# Appendix A Vendors

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Advanced Business Technology  
5180 Coleman Ave.  
San Jose, CA 95110  
(408) 275-9880

Advanced Logic Systems  
1195 E. Argues Ave.  
Sunnyvale, CA 94086  
(408) 730-0306  
or (800) 538-8177

ALF Products Inc.  
1315 F Nelson St.  
Denver, CO 80215  
(303) 234-0871

Alphacom, Inc.  
2323 S. Bascom Ave.  
Campbell, CA 95008  
(408) 379-3186

Amdek Corporation  
2201 Lively Blvd.  
Elk Grove Village, IL 60007  
(312) 595-6890

Anchor Automation, Inc.  
6913 Valjean Ave.  
Van Nuys, CA 91406  
(818) 997-6493

Apple Computer, Inc.  
20525 Mariana Ave.  
Cupertino, CA 95014  
(408) 996-1010

Applied Engineering  
P.O. Box 798  
Carrollton, TX 75006  
(214) 492-2027

Axlon  
1287 Lawrence Station Rd.  
Sunnyvale, CA 94086  
(408) 747-1900

Bay Technical Associates, Inc.  
Highway 603  
St. Louis, MS 39520  
(800) 523-2702

**Belkin Components**  
4718 W. Rosecrans  
Hawthorne, CA 90250  
(213) 644-3184

**BMC USA**  
16830 South Avalon Blvd.  
Carson, CA 90746  
(213) 515-6005

**Brother**  
6070 Rickenbacker Rd.  
City of Commerce, CA 90040  
(213) 727-1227

**Burke & Associates**  
1720 Los Angeles Ave., #221  
Simi Valley, CA 93063  
(805) 584-3220

**C. Itoh Digital Products, Inc.**  
5301 Beethoven St.  
Los Angeles, CA 90066  
(203) 306-6700

**CH Products**  
1558 Osage St.  
San Marcos, CA 92069  
(619) 744-8546

**Chalk Board, Inc.**  
3772 Pleasantdale Rd.  
Atlanta, GA 30340  
(404) 447-6711

**Comrex International Inc.**  
3701 Skypark Dr., Suite 120  
Torrance, CA 90505  
(213) 373-0280

**Concorde Peripheral Systems, Inc.**  
23152 Verdugo Dr.  
Laguna Hills, CA 92653  
(714) 859-2850

**Corona Data Systems**  
31324 Via Colinas, Section 110  
Westlake Village, CA 91361  
(800) 621-6746  
or (818) 991-1144

**Corvus Systems, Inc.**  
2029 O'Toole Ave.  
San Jose, CA 95131  
(408) 946-7700

**Creative Computer Peripherals**  
Aztec Environmental Center  
1044 Lacey Rd.  
Forked River, NJ 08731  
(609) 693-0002

**Cuesta Systems, Inc.**  
3440 Roberto Court  
San Luis Obispo, CA 93401  
(805) 541-4161

**Data Terminals & Communications**  
590 Division St.  
Campbell, CA 95008  
(408) 378-1112

**Datamac**  
432 Lakeside Dr.  
Sunnyvale, CA 94086  
(408) 733-4200

**Diablo Systems Inc.**  
P.O. Box 5030  
Fremont, CA 94537  
(415) 498-7000

**Digital Electronic Systems, Inc.**  
107 Euclid Ave.  
Mountain Brook, AL 35213  
(205) 871-0987

Digital Research Inc.  
P.O. Box 579  
Pacific Grove, CA 93950  
(800) 227-1617  
California: (800) 772-3545

Discwasher  
1407 North Providence Rd.  
P.O. Box 6021  
Columbia, MO 65205

Dynax, Inc.  
5698 Bandini Blvd.  
Bell, CA 90201  
(213) 260-7121

EPD, Inc.  
P.O. Box 673  
Waltham, MA 02254  
(617) 891-6602

Epson America, Inc.  
3415 Kashiwa St.  
Torrance, CA 90505  
(213) 539-9140

Executive Peripheral System, Inc.  
800 San Antonio Rd.  
Palo Alto, CA 94303  
(415) 856-2822

Genie Technologies  
31117 Via Colinas, #402  
Westlake Village, CA 91362  
(818) 991-6210

Hayes Microcomputer Products, Inc.  
5923 Peachtree Industrial Blvd.  
Norcross, GA 30092  
(404) 441-1617

Houston Instrument  
8500 Cameron Rd.  
Austin, TX 78753  
(512) 835-0900

Interactive Structures, Inc.  
146 Montgomery Ave.  
P.O. Box 404  
Bala Cynwyd, PA 19004  
(215) 667-1713

Juki Industries of America, Inc.  
299 Market St.  
Saddle Brook, NJ 07662  
(201) 368-3666

Key Tronic Corp.  
P.O. Box 14687  
Spokane, WA 99214  
(800) 262-6006

Koala Technologies Corp.  
3100 Patrick Henry Dr.  
Santa Clara, CA 95052  
(800) KOA-BEAR

Kraft Systems  
P.O. Box 1268  
450 W. California Ave.  
Vista, CA 92083  
(619) 724-7146

Leading Edge Products, Inc.  
225 Turnpike St.  
Canton, MA 02021  
(800) 343-6833

Legend Industries, Ltd.  
2220 Scott Lake Rd.  
Pontiac, MI 48054  
(313) 674-0953

Ligo Research, Inc.  
396 E. 159th St.  
Harvey, IL 60426  
(312) 331-8797

Magellan Computer, Inc.  
4371 E. 82nd St., Suite D  
Indianapolis, IN 46250  
(317) 842-9134

Mannesmann Tally Corp.  
8301 South 180th St.  
Kent, WA 98032  
(206) 251-5524

Micro-Design  
6301-13 Manduca Rd.  
Austin, TX 78745  
(800) 531-5002

Microsci  
2158 S. Hathaway St.  
Santa Ana, CA 92705  
(714) 241-5600

Microsoft Corp.  
10700 Northrup Way  
Bellevue, WA 98004  
(206) 828-8099

NEC Information Systems, Inc.  
1414 Massachusetts Ave.  
Boxborough, MA 01719  
(800) 343-4419

Nestar Systems, Inc.  
2585 East Bayshore Rd.  
Palo Alto, CA 94303  
(415) 493-2223

North Atlantic Industries  
Qantex Division  
60 Plant Ave.  
Hauppauge, NY 11788  
(516) 582-6060

Novation, Inc.  
20409 Prairie St.  
Chatsworth, CA 91311  
(818) 996-5060

Okidata  
111 Gaither Dr.  
Mt. Laurel, NJ 08054  
(609) 235-2600

Olympia USA Inc.  
P.O. Box 22, Route 22  
Sommerville, NJ 08876  
(201) 722-7000

Omega Micro  
215 W. First, Suite 105-61  
Tustin, CA 92680  
(714) 730-1463

Orbital Systems  
2929 E. Jasmine  
Mesa, AZ 85203  
(602) 996-5064

Pace Systems  
24 W. 500 Maple Ave.  
Naperville, IL 60540  
(312) 355-9722

Panamax  
150 Mitchell Blvd.  
San Rafael, CA 94930  
(415) 472-5547

Personal Computer Products, Inc.  
16776 Bernardo Center Dr., Suite 202  
San Diego, CA 92128  
(619) 485-8411

PGS Princeton Graphic Systems  
1101-1 State Rd.  
Princeton, NJ 08540  
(609) 683-1660

Polytel Computer Products Corp.  
2121 S. Columbia  
Tulsa, OK 74114  
(918) 744-9844

PPW Inc.  
180 15th St.  
Jersey City, NJ 07302  
(201) 656-8230

Practical Peripherals  
31245 La Baya Dr.  
Westlake Village, CA 91362  
(818) 991-8200

PRENTICE Corp.  
355 Caspian Dr.  
Sunnyvale, CA 94086  
(408) 734-9810

Prometheus Products, Inc.  
45277 Fremont Blvd.  
Fremont, CA 94538  
(415) 490-2370

PTI Industries  
320 River St.  
Santa Cruz, CA 95060  
(408) 429-6881

Quadram Corporation  
4355 International Blvd.  
Norcross, GA 30093  
(404) 923-6666

Quark Inc.  
2525 West Evans, Suite 220  
Denver, CO 80219  
(303) 934-2211

Quentin Research, Inc.  
9207 Eton Ave.  
Chatsworth, CA 91311  
(818) 709-6550

Rana Systems  
20620 S. Leapwood Ave.  
Carson, CA 90746  
(213) 538-2353

RGB Display Corp.  
1107 Upas  
McAllen, TX 78501  
(512) 630-6979

RTE DELTEC Corp.  
2727 Kurtz St.  
San Diego, CA 92110  
(800) 854-2658

Sakata U.S.A. Corp.  
651 Bonnie Lane  
Elk Grove Village, IL 60007  
(800) 323-6647

Silver-Reed America, Inc.  
19600 South Vermont Ave.  
Torrance, CA 90502  
(800) 421-4191

Smith-Corona  
65 Locust Ave.  
New Canaan, CT 06840  
(203) 972-1471

Sola Electric  
1717 Busse Rd.  
Elk Grove Village, IL 60007  
(312) 439-2800

Spies Laboratories  
P.O. Box 336  
Lawndale, CA 90260  
(213) 538-8166

Star Micronics, Inc.  
200 Park Ave.  
New York, NY 10166  
(212) 986-6770

Street Electronics Corp.  
1140 Mark Ave.  
Carpinteria, CA 93013  
(805) 684-4593

Sweet Micro Systems  
50 Freeway Dr.  
Cranston, RI 02920  
(401) 461-0530



Synetix, Inc.  
10635 NE 38th Place  
Kirkland, WA 98033  
(800) 426-7412

Tech Designs Inc.  
3638 Grosvenor Dr.  
Ellicott City, MD 21043  
(301) 792-1818

Teletex Communications Corp.  
3420 E. Third Ave.  
Foster City, CA 94404  
(415) 341-1300

Texprint  
220 Reservoir St.  
Needham Heights, MA 02194  
(617) 449-5808  
or (800) 255-1510

TG Products  
1104 Summit Ave., Suite 106  
Plano, TX 75074  
(214) 424-8568

Thunderware  
19-G Orinda Way  
Orinda, CA 94563  
(415) 254-6581

Titan Technologies  
P.O. Box 8050  
Ann Arbor, MI 48107  
(313) 973-8422

Topaz, Inc.  
9192 Topaz Way  
San Diego, CA 92123  
(619) 279-0831

Trackhouse  
161 S. Viking Ave.  
Brea, CA 92621  
(714) 671-3937

U.S. Robotics, Inc.  
1123 W. Washington Blvd.  
Chicago, IL 60607  
(312) 733-0497

USI Computer Products  
71 Park Lane  
Brisbane, CA 94005  
(415) 468-4900

Video-7 Incorporated  
12340 Saratoga Sunnyvale Rd., Suite 1  
Saratoga, CA 95070  
(408) 725-1433

Videx, Inc.  
1105 NE Circle Blvd.  
Corvallis, OR 97330  
(503) 758-0521

Vista Computer  
1317 East Edinger Ave.  
Santa Ana, CA 92707  
(714) 953-0523

Vivitar Computer Products, Inc.  
P.O. Box C-96975  
Bellevue, WA 98009  
(206) 454-9250

Vufax, Inc.  
5301 Covington Hwy.  
Decatur, GA 30035  
(800) 241-1119  
or (404) 981-6788

ZOOM Telephonics Inc.  
207 South St.  
Boston, MA 02111  
(617) 423-1072

# Appendix B

## Bulletin Boards

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### PUBLIC ACCESS MESSAGE (and file transfer) SYSTEMS (P.A.M.S.)

Compliments of Peoples' Message System, Santee CA.

(6 1 9) 5 6 1 - 7 2 7 7

Compiled and maintained by Bill Blue  
(with a lot of help from his friends)

Please send updates/corrections to:  
P M S Santee, TCB117, 70315,1305 or BBLUE

- \* denotes 24-hour operation
- + denotes 8-12 hour DAYTIME operation ONLY
- denotes 8-12 hour NIGHTTIME operation ONLY
- ! new system or new number to existing system
- \$ Supports VADIC 1200-baud operation
- & Supports 212A 1200-baud operation
- % Supports BAUDOT operation
- #1 denotes original system of that type
- dd. denotes game-oriented messages
- dl. download/program exchange system
- ml. mail/information exchange only
- rb. denotes call, let ring once, and call back

- rl. religious orientation
- so. sexually-oriented messages

Regular updates of this list may be found on CompuServe MAUG XA4, The Source PUBLIC 112, and most participating independent P M S systems.

ABBS Akron Digital Group, Akron, OH .....	(216) 745 7855*
ABBS Analog, Port Coquitlam, BC, CN .....	! (604) 941 0041*
ABBS Apple-Mate, New York, NY.....	(201) 864 5345
ABBS Byte Shop, Ft. Lauderdale, FL.....	(305) 486 2983
ABBS Byte Shop, Miami, FL.....	(305) 261 3639
ABBS Calvary Mission Church, Mnpls, MN.....	(612) 472 3985*rl.
ABBS CCNJ, Pompton Plains, NJ .....	(201) 835 7228
ABBS Charlotte, NC .....	(704) 364 5245*
ABBS CODE, Glen Ellyn, IL .....	(312) 882 2926*
ABBS Colortron Computer, Racine, WI.....	(414) 637 9990*
ABBS Compumart, Ottawa, Ontario, CN.....	(613) 725 2243
ABBS Computer Room, Kalamazoo, MI.....	(616) 382 0101
ABBS Gamemaster, Chicago, IL .....	(312) 475 4884*
ABBS Ketchikan, AK.....	(907) 225 6789
ABBS LINX, Lincoln, NE.....	(402) 476 1177*dl.
ABBS New York, NY.....	! (516) 473 1005*
ABBS New York, NY.....	! (212) 877 7703*
ABBS Nussy Game System, Itasca, IL .....	(312) 773 3308*
ABBS Nussy Flynn's BBS, Crystal Lake, IL .....	(815) 455 2406
ABBS Omaha, NE .....	(402) 339 7809
ABBS Pacific Palisades, Los Angeles, CA .....	(213) 459 6400
ABBS Peoria, IL.....	(309) 692 6502
ABBS Phoenix, AZ .....	(602) 898 0891
ABBS Pirates Cove, Long Island, NY .....	(516) 698 4008
ABBS Rogers Park, Chicago, IL .....	(312) 973 2227
ABBS Software Sorcery, Herndon, VA.....	&(703) 471 0610*
ABBS South of Market, San Francisco, CA .....	(415) 469 8111 so.
ABBS The Pulse, Dallas, TX.....	(214) 631 7747*so.
ABBS Teledunjon III, Dallas, TX.....	(214) 960 7654
ABBS Turnersville, NJ .....	(609) 228 1149
ABBS Vancouver, BC, CN.....	(604) 437 7001
ABBS Vermont, Essex Junction, VT .....	(802) 879 4981*
ABBS Video Adv. Movie Marquee, Evanston, IL.....	(312) 475 5282
ABBS West Palm Beach, FL .....	(305) 848 3802
ACS Arlington Heights, IL .....	#1 (312) 392 2403
ACS Chicago, IL.....	(312) 445 1130
A-C-C-E-S-S Annapolis, MD .....	(301) 267 7666*
A-C-C-E-S-S Phoenix, AZ .....	&(602) 957 4428*
A-C-C-E-S-S Call-A-Lawyer, Phoenix, AZ .....	(602) 275 6644
A-C-C-E-S-S Scotsdale, AZ.....	(602) 998 9411*
A-C-C-E-S-S Wyckoff, NJ.....	(201) 891 7441*

AMIS A.R.C.A.D.E. Sterling Heights, MI .....	(313)	978	8087*
AMIS Clarendon Hills, IL .....	(312)	789	3610*
AMIS GRAFEX Cupertino, CA.....	(408)	253	5216
AMIS G.R.A.S.S. Grand Rapids, MI.....	(616)	241	1971*
AMIS IBBBS San Jose, CA.....	(408)	298	6930
AMIS M.A.C.E. Detroit, MI.....	#1!	(313)	589 0996*
AMIS T.A.B.B.S. Sunnyvale, CA .....	(408)	942	6975
ARMUDIC Washington, DC.....	#1	(202)	276 8342
ARMUDIC Computer Age, Baltimore, MD.....	(301)	587	2132
BBS IBM Hostcomm Atlanta, GA .....	(404)	252	4146
BBS IBM Hostcomm Fairfax, VA .....	(703)	978	9592*
BBS IBM Hostcomm Fairfax, VA .....	!(703)	385	7373*
BBS IBM Hostcomm Fairfax, VA .....	!(703)	385	8384*
BBS IBM Hostcomm Springfield, VA .....	(703)	425	7229*
BBS IBM Hostcomm Houston, TX .....	(713)	890	0310*
BBS IBM Hostcomm Toronto, Ontario, CN.....	(416)	499	7023*
BBS IBM PC Annandale, VA.....	(703)	560	0979*
BBS IBM PC Atlanta, GA.....	!(404)	928	3005
BBS IBM PC Atlanta, GA.....	(404)	252	9438*
BBS IBM PC Beltsville, MD .....	(301)	937	4339*
BBS IBM PC Bethesda, MD.....	(301)	460	0538*
BBS IBM PC Charlotte, NC .....	(704)	365	4311*
BBS IBM PC Computer Society, Boston, MA .....	(617)	353	9312-
BBS IBM PC Culver City, CA .....	&(213)	649	1489*
BBS IBM PC Niles, IL .....	(312)	991	8887*
BBS IBM PC Dale City, VA .....	(703)	680	5220*
BBS IBM PC Gaithersburg, MD .....	(301)	251	6293*
BBS IBM PC Great Falls, VA.....	&(703)	759	5049*
BBS IBM PC Madison, WI .....	(608)	262	4939*
BBS IBM PC Rockville, MD.....	(301)	949	8848*
BBS IBM PC Vienna, VA .....	(703)	560	7803*
BBS IBM PCmodem Chicago, IL.....	&(312)	882	4227*
BBS IBM PCmodem Chicago, IL.....	(312)	376	7598*
BBS IBM PC SIG, San Diego, CA .....	!(619)	268	0437*
BULLET-80 Boston, MA .....	&(617)	266	7789*
BULLET-80 Chesterland, OH.....	(216)	729	2769
BULLET-80 Danbury, CT .....	#1(203)	744	4644
BULLET-80 El Paso, TX.....	(915)	565	9903*
BULLET-80 Fayetteville, GA.....	(404)	461	9686
BULLET-80 Hattiesburg, MS .....	(601)	264	2361*
BULLET-80 Holstein, IA.....	(712)	368	2651
BULLET-80 Langhorne, PA .....	(215)	364	2180
BULLET-80 New York, NY .....	(212)	740	5680*
BULLET-80 Orange County, Anaheim, CA.....	(714)	952	2110
BULLET-80 Seymour, CT.....	(203)	888	7952

BULLET-80 Springfield, IL .....(217) 529 1113  
 BULLET-80 Waterford, MI.....!(313) 628 4350\*  
 BULLET-80 Pirate Place, Newport Beach, CA.....(714) 644 7942  
 CBBS AMRAD, Washington, DC .....(703) 734 1387\*  
 CBBS Aurora Computer Peripherals, Aurora, CO .....(312) 897 9037\*  
 CBBS Baton Rouge, LA.....(504) 273 3116\*  
 CBBS Boston, MA.....(617) 646 3610\*  
 CBBS Cedar Rapids, IA .....(319) 364 0811\*  
 CBBS Chicago, IL .....#1(312) 545 8086\*  
 CBBS CPEUG/ICST Gaithersburg, MD .....(301) 948 5717  
 CBBS Lambda, Berkeley, CA.....(415) 658 2919 so.  
 CBBS Lawrence General Hospital, Boston, MA.....(617) 683 2119  
 CBBS LICA LIMBS, Long Island, NY .....(516) 561 6590\*  
 CBBS London, England . . (European standard) .....(044) 1 399 2136  
 CBBS Long Island, NY.....(516) 334 3134\*  
 CBBS MAUDE Milwaukee, WI.....(414) 241 8364\*  
 CBBS MicroStar, Worcester, MA .....(617) 752 7284  
 CBBS NW, Portland, OR .....(503) 646 5510\*  
 CBBS PACC, Pittsburgh, PA .....(412) 822 7176\*  
 CBBS Prince George, B.C., CN.....(604) 562 9515  
 CBBS Proxima, Berkeley, CA .....(415) 357 1130  
 CBBS RAMS, Rochester, NY .....(716) 244 9531  
 CBBS Rosemont, MN.....(612) 423 5016  
 CBBS St. Petersburg, FL.....(813) 866 9945\*  
 CBBS Strictly Software, Honolulu, HI .....(808) 944 0562  
 CBBS TSG, Tucson, AZ.....!(602) 574 0327\*  
 COMNET-80 Akron, OH.....&(216) 645 0827\*  
 COMNET-80 Las Vegas, NV.....&(702) 870 9986  
 COMNET-80 Mt. Clemens, MI.....&(313) 465 9531  
 COMNET-80 North Wales, PA.....(215) 855 3809 so.  
 COMNET-80 Riverside, CA .....&(714) 359 3189  
 COMNET-80 Riverside, CA .....&(714) 877 2253  
 COMNET-80 Wichita Falls, TX.....(817) 767 5847  
 CONNECTION-80 Centereach, NY .....(516) 588 5836  
 CONNECTION-80 Fremont, CA .....(415) 651 4147\*  
 CONNECTION-80 Gaithersburg, MD .....!(301) 946 1252\*  
 CONNECTION-80 JACS, Jacksonville, FL .....(904) 353 5227\*  
 CONNECTION-80 Lansing, MI.....(517) 339 3367  
 CONNECTION-80 Laval BELE, Laval, Quebec, CN.....(514) 622 1274\*  
 CONNECTION-80 Manhattan, NY.....(212) 991 1664  
 CONNECTION-80 Orlando, FL .....(305) 644 8327\*  
 CONNECTION-80 Peterborough, NH.....(603) 924 7920  
 CONNECTION-80 Winter Garden, FL.....(305) 894 1886\*  
 CONNECTION-80 Woodhaven, NY.....(212) 441 3755\*  
 CONNECTION-80 Tampa, FL.....(813) 977 0989

CONFERENCE-TREE Berkeley, CA .....(408) 475 7101  
 CONFERENCE-TREE Computerland, Honolulu, HI .....(808) 487 2001\*  
 CONFERENCE-TREE Cookeville, TN.....!(615) 528 5039\*  
 CONFERENCE-TREE Flagship, Rockaway, NJ .....(201) 627 5151\*  
 CONFERENCE-TREE Hayward, CA.....(415) 538 3580  
 CONFERENCE-TREE Kelp Bed, Los Angeles, CA .....(213) 372 4800  
 CONFERENCE-TREE Minneapolis, MN.....(612) 854 9691  
 CONFERENCE-TREE Phoenix, AZ.....(602) 931 1829\*  
 CONFERENCE-TREE San Francisco, CA .....#1(415) 861 6489  
 CONFERENCE-TREE Santa Monica, CA.....(213) 394 1505  
 CONFERENCE-TREE Sausalito, CA .....(415) 332 8115  
 CONFERENCE-TREE Tacoma, WA.....!(206) 759 0615\*  
  
 DIAL-YOUR-MATCH #1 .....(213) 842 3322 so.  
 DIAL-YOUR-MATCH #3 .....(912) 233 0863 so.  
 DIAL-YOUR-MATCH #4 .....(213) 783 2305 so.  
 DIAL-YOUR-MATCH #8, San Francisco, CA.....(415) 467 2588 so.  
 DIAL-YOUR-MATCH #9 .....(213) 345 1047 so.  
 DIAL-YOUR-MATCH #11, Carlsbad, CA .....(619) 434 4600\*so.  
 DIAL-YOUR-MATCH #12, Houston, TX.....(713) 556 1531\*so.  
 DIAL-YOUR-MATCH #14 .....(201) 272 3686 so.  
 DIAL-YOUR-MATCH #16 .....(206) 256 6624 so.  
 DIAL-YOUR-MATCH #17 .....(415) 991 4911 so.  
 DIAL-YOUR-MATCH #18 .....(617) 334 6369 so.  
 DIAL-YOUR-MATCH #20 .....(919) 362 0676 so.  
 DIAL-YOUR-MATCH #21, Freehold, NJ .....(201) 462 0435 so.  
 DIAL-YOUR-MATCH #22 .....(213) 990 6830 so.  
 DIAL-YOUR-MATCH #23, Omaha, NE .....(402) 571 8942 so.  
 DIAL-YOUR-MATCH #26, Clovis, CA .....(209) 298 1328 so.  
 DIAL-YOUR-MATCH #33, Poway, CA .....(619) 748 8746\*so.  
 DIAL-YOUR-MATCH #37, Flint, MI .....(313) 736 1398 so.  
 DIAL-YOUR-MATCH #38, Austin, TX .....(512) 451 8747 so.  
 DIAL-YOUR-MATCH #39, Chicago, IL .....(312) 243 1046 so.  
 DIAL-YOUR-MATCH #46.....!(318) 222 2032-so.  
  
 FORUM-80 Augusta, GA .....(803) 279 5392  
 FORUM-80 Cleveland, OH .....&(216) 486 4176  
 FORUM-80 El Paso, TX .....(915) 755 1000\*  
 FORUM-80 Ft. Lauderdale, FL.....(305) 772 4444\*  
 FORUM-80 Hull, England.....(011) 44 482 859169  
 FORUM-80 Kansas City, MO .....&(816) 931 9316  
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 FORUM-80 Linden, NJ .....(201) 486 2956\*  
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 FORUM-80 Monmouth, Brielle, NJ.....(201) 974 1196\*  
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FORUM-80 Prince William County, VA .....(703) 670 5881\*  
 FORUM-80 San Mateo, CA .....&(415) 348 2139  
 FORUM-80 Seattle, WA .....(206) 723 3282  
 FORUM-80 Sierra Vista, AZ .....(602) 458 3850\*  
 FORUM-80 Westford, MA .....(617) 692 3973  
 FORUM-80 Wichita, KS .....&(316) 682 2113\*  
  
 GABBS Armadillo Media, Houston, TX .....(713) 444 7098\*  
 GABBS Food for Thought, Omaha, NE .....!(402) 551 4618\*  
 GABBS Mindstore, Terre Haute, IN .....!(812) 235 0909\*  
 GABBS The Great Apple, Houston, TX .....(713) 455 9502\*  
 GABBS Vox Populi, Houston, TX .....!(713) 772 6096\*  
 GREENE MACHINE Golden State BBS, Novato, GA .....(415) 897 2783  
 GREENE MACHINE Riverside, CA .....(714) 354 8004  
 GREENE MACHINE Chicago, IL .....(312) 622 4442 so.  
 GREENE MACHINE Corsair, WPB, FL .....(305) 968 8653  
 GREENE MACHINE Rome, NY .....(315) 337 7720  
 GREENE MACHINE Sunnymead, CA .....!(714) 924 2229\*  
 GREENE MACHINE Yuma, AZ .....&(602) 726 7533\*  
  
 HBBS Heath/Zenith, Grand Rapids, MI .....&(616) 531 0890  
 HBBS MOG-UR, Granada Hills, CA .....&(213) 366 1238\*  
  
 MCMS C.A.M.S. Chicago, IL .....#1&(312) 927 1020\*  
 MCMS J.A.M.S. Lockport, IL .....(815) 838 1020\*  
 MCMS P.C.M.S. Wheaton, IL .....&(312) 462 7560\*  
 MCMS Goliath, Minneapolis, MN .....(612) 753 3082  
 MCMS NC Software, Minneapolis, MN .....(612) 533 1957\*  
 MCMS WACO Hot Line, Schaumburg, IL..<pvt> .....(312) 351 4374\*  
 MCMS Word Exchange, Springfield, IL .....(217) 753 4309\*  
  
 NET-WORKS ABC, Kansas City, MO .....(816) 483 2526  
 NET-WORKS Adventure's Inn, Lake Forest, IL .....(312) 295 7284\*  
 NET-WORKS AGS, Augusta, GA .....(404) 733 3461\*  
 NET-WORKS Apple Gumbo, Shreveport, LA .....(318) 861 1012\*  
 NET-WORKS Apple Juice, Drien, IL .....(312) 685 9573  
 NET-WORKS Apple Net, Chicago, IL .....(312) 963 5384  
 NET-WORKS Apple-Technical, Chicago, IL .....(312) 935 3091  
 NET-WORKS Armadillo, Grand Forks, ND .....(701) 746 4959  
 NET-WORKS Assembly Line, Louisville, KY .....(502) 459 5531-  
 NET-WORKS Asylum, Edwardsville, IL .....(618) 692 0742  
 NET-WORKS Baud-ville, Louisville, KY .....(502) 523 0695-  
 NET-WORKS Beach BBS, Pensacola, FL .....(904) 932 8271  
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 NET-WORKS Briar-Net, Houston, TX .....(713) 782 5706\*  
 NET-WORKS Brooklyn, NY .....(212) 410 0949  
 NET-WORKS C.A.M.S., Decatur, IL .....!(217) 875 7114\*  
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 NET-WORKS Computer Market, Honolulu, HI.....(808) 524 6668-  
 NET-WORKS Computer Pro, Ft. Worth, TX.....(817) 732 1787  
 NET-WORKS Computer World, Los Angeles, CA.....(213) 859 0894\*  
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 NET-WORKS Greenfield, IN .....!(317) 326 4152\*  
 NET-WORKS Honolulu, HI .....!(808) 524 6652  
 NET-WORKS Hawaii Connection, Honolulu, HI.....(808) 423 1593\*  
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 NET-WORKS Magnetic Fantasies, Los Angeles, CA .....(213) 388 5198  
 NET-WORKS MicroBBS, Chelmsford, MA.....!(617) 889 4330  
 NET-WORKS Micro Ideas, Glenview, IL .....(312) 998 5066  
 NET-WORKS Mines of Moria, Houston, TX.....(713) 871 8577\*  
 NET-WORKS N A G S, Alton, IL.....(618) 466 9497  
 NET-WORKS Nick Naimo, Newburgh, IN.....#1(812) 858 5405  
 NET-WORKS Pirate's Harbor, Boston, MA.....(617) 720 3600  
 NET-WORKS Pirate's Harbor, Cambridge, MA .....(617) 494 1985  
 NET-WORKS Pirate's Lodge, New City, NY.....(914) 634 1268  
 NET-WORKS Portsmouth, NH.....(603) 436 3461  
 NET-WORKS RJNET, Warnville, IL .....(312) 393 4755  
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 NET-WORKS The Dark Realm, Houston, TX .....(713) 333 2309\*dd.  
 NETWORKS The Dragon's Lair NW, San Jose, CA.....(408) 996 7464  
 NET-WORKS The Shadow World, Houston, TX .....(713) 777 8608\*  
 NET-WORKS The Silver Tongue, St. Joseph, MO .....(816) 232 3153  
 NET-WORKS The System, Houston, TX .....(713) 785 7996-  
 NET-WORKS The Weekender, Houston, TX.....(713) 492 8700\*  
 NET-WORKS Toronto, Ontario, CN .....(416) 445 6696\*  
 NET-WORKS Warlock's Castle St. Louis, MO .....(618) 345 6638  
 NET-WORKS Zachary\*Net, Houston, TX .....(713) 933 7353\*  
 ONLINE Dickinsons Movie Guide, Mission, KS .....(913) 432 5544\*  
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 PET BBS Commodore, Chicago, IL .....(312) 397 0871\*  
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RCP/M CBBS Frog Hollow, Vancouver, BC, CN.....(604) 937 0906\*  
RCP/M CBBS Maxicom, Farmers Branch, TX.....&\$(214) 241 1939\*  
(214) 247 5307-  
  
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RCP/M Chuck Forsberg, OR.....&(503) 621 3193\*  
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RCP/M CUG-NODE, PA State College, PA.....(814) 238 4857\*  
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RCP/M NEI, Chicago, IL.....&(312) 949 6189-  
RCP/M North Chicago, Chicago, IL.....(312) 937 5639  
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RCP/M RBBS El Paso, TX .....&(915) 598 1668\*  
RCP/M RBBS EPSON, Braintree, MA.<pw=Epson> .....!(617) 848 8281  
RCP/M RBBS EPSON, Bristol, PA.<pw=Epson> .....!(215) 788 5614  
RCP/M RBBS EPSON, Dallas, TX.<pw=Epsonstc> .....!(214) 659 0387  
RCP/M RBBS EPSON, Placentia, CA.<pw=Amber> .....!(714) 632 8332  
RCP/M RBBS EPSON, San Francisco, CA.<Epson> .....!(415) 589 5062  
RCP/M RBBS EPSON, Torrance, CA.<pw=Toledo> .....!(213) 618 8674  
RCP/M RBBS Fairfield, CA .....!(707) 422 7256\*  
RCP/M RBBS Fort Mill, SC .....(803) 548 0900\*  
RCP/M RBBS GFRN Dta Exch. Garden Grove, CA .....\$&(714) 534 1547\*  
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RCP/M RBBS IBM-PC, Hawthorne, CA .....\$(213) 973 2374  
RCP/M RBBS IBM-PC, Orlando, FL .....\$&(305) 830 4340\*  
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RCP/M RBBS Laurel, MD .....(301) 953 3753\*  
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RCP/M RBBS Marin County, CA .....(415) 383 0473\*  
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RCP/M RBBS Orlando, FL .....\$&(305) 671 2330\*  
RCP/M RBBS Pasadena, CA .....\$(213) 577 9947\*  
RCP/M RBBS Pegasus, Houston, TX .....(713) 862 1624\*  
RCP/M RBBS Pickerington, OH .....(614) 837 3269  
RCP/M RBBS Piconet, Mt. View, CA .....(415) 965 4097  
RCP/M RBBS Pontiac, MI .....(313) 338 8505  
RCP/M RBBS Paul Bogdanovich, NJ .....(201) 747 7301  
RCP/M RBBS Rutgers, New Brunswick, NJ .....(201) 932 3879\*  
RCP/M RBBS San Diego, CA .....\$&(619) 273 4354\*

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RCP/M RBBS Southfield, MI.....(313) 559 5326\*  
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RCP/M RBBS SDCS San Diego, CA.....(619) 236 0742\*  
RCP/M RBBS SDCS HEC#04, La Mesa, CA .....!(619) 461 5117\*  
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RCP/M RBBS Rich & Famous, San Francisco, CA .....(415) 552 9968\*  
RCP/M RBBS Satsuma, Houston, TX.....&(713) 469 8893-  
RCP/M RBBS Simi Valley, CA .....(805) 527 2219-  
  
RCP/M RBBS SJBBS Bearsville, NY.....(914) 679 6559\*rb.  
RCP/M RBBS SJBBS Johnson City, NY .....(607) 797 6416-  
RCP/M Software Tools, Sydney, Australia .....61 02 997 1018\*  
RCP/M Sunnyvale, CA.....(408) 730 8733-  
RCP/M Superbrain, Lexington, MA.....\$&(617) 862 0781\*  
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RCP/M System Two, Toronto, CN .....&(416) 231 1262\*  
RCP/M Technical, Houston, TX.....(713) 522 3805 rb.  
RCP/M Technical, Thousand Oaks, CA.....&(805) 492 5472\*  
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RCP/M W. Carrolton, Dayton, OH.....(513) 435 5201\*  
  
Remote Northstar Denver, CO .....(303) 444 7231  
Remote Northstar NASA, Greenbelt, MD.....(301) 344 9156  
Remote Northstar Santa Barbara, CA .....(805) 964 4115  
Remote Northstar Virginia Beach, VA .....(804) 340 5246  
  
ST80-CC Lance Micklus, Inc. Burlington, VT.....#1(802) 862 7023\*  
ST80-PBB Monroe Camera Shop, Monroe, NY.....(914) 782 7605  
  
TCBBS Astrocom, New York, NY .....#1(212) 799 4649\*  
TCBBS B.A.M.S. New York, NY .....(212) 362 1040\*  
  
T-NET Central Processing Unit, Plymouth, MI.....(313) 453 5146\*  
T-NET Delta Connection, Lawrenceville, NJ.....(609) 896 2436\*  
T-NET Special Corp., W. Bloomfield, MI.....(313) 855 6321\*  
T-NET Twilight Phone, Warren, MI.....#1(313) 775 1649\*  
  
TBBS Aurora, CO .....#1(303) 690 4566  
TBBS Austin, TX .....#1(512) 385 1102\*  
TBBS Beer City, Milwaukee, WI .....&(414) 355 8839\*  
TBBS Canopus, Milwaukee, WI .....(414) 281 0545\*  
TBBS Exity 2000, Houston, TX .....&(713) 442 7644\*  
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TBBS Hawkins, TX.....&(214) 769 3036\*  
TBBS Noah's Ark, Fremont, CA.....(415) 490 8083\*so.  
TBBS Pizza-Net, Orlando, FL.....(305) 645 5543\*  
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 Adventure BBS, Roslyn, NY.....(516) 621 9296  
 Alpha, Tampa, FL. .<acct#=ABCDOO, pw=TRYIT> .....(813) 969 0512\*  
 Aphrodite-E, Patterson, NJ .....!(201) 831 1042 so.  
 Apollo's Chariot, Apollo, FL.....(813) 645 3669  
 Applecrackers, Columbus, OH.....(614) 475 9791\*  
 Apple Crunch, Houston, TX .....(713) 468 3122  
  
 ARBB Seattle, WA.....(206) 546 6239  
 Atacom/80 San Leandro, CA .....(415) 895 8980\*  
 Atari BBS, Virginia Beach, VA .....(804) 491 1437\*  
 Austin Party Board, Austin, TX.....(512) 442 1116\*  
 Aviators Bulletin Board, Sacramento, CA.....(916) 393 4459  
 Blax-80 BBS, Phoenix, AZ.....(602) 952 1382\*  
 BBS Apollo, Phoenix, AZ.....(602) 246 1432\*  
 BBS Atari AMIS, Kansas City, MO .....(816) 587 9543\*  
 BBS B.R., Los Angeles, CA.....(213) 394 5950\*  
 BBS Colormet, Providence, RI.....\$(401) 521 2626-  
 BBS Commodore, San Juan, PR.....(809) 781 0350-  
 BBS Computer Applications Co., Poland, OH .....(216) 757 3711  
 BBS Gandalf #2, Heightstown, NJ .....!(609) 448 8244  
 BBS Heathkit Store, Warwick, RI.....(401) 738 5152-  
 BBS Homestead, FL.....(305) 246 1111  
 BBS MCUA, Houston, TX .....(713) 661 5428\*  
 BBS Pensacola, FL.....(904) 477 8783  
 BBS-16 Santa Rosa, CA.....(707) 527 5908  
 BBS SUE Milwaukee, WI.....!(414) 327 6010  
 BBS The BULL, Toronto, Ontario, CN.....(416) 423 3265 so.  
 BBS The Safehouse, Minneapolis, MN.....(612) 724 7066\*  
 BBS-80 DALTRUG, Dallas, TX .....(214) 289 1386\*  
 BBS Syslink, Providence, RI.....(401) 272 1138\*  
 Big Top Games Systems, Milwaukee, WI.....(414) 259 9475  
 Bird House, San Jose, CA .....(408) 267 7399  
 Boston Information Exchange, Boston, MA.....&(617) 423 6985\*  
 Bradley Computer BBS, Tampa, FL .....(813) 734 7103  
 BSBB Tampa, FL .....(813) 885 6187  
 Capital City BBS, Albany, NY.....(518) 346 3596\*  
 Cass-80 Hickory Hills, IL.....(312) 598 4861  
 C.M.M.S. Chicago, IL.....(312) 957 3924\*  
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COLOUR-80, Orange Park, FL .....	(904) 264 0335*
Commodore Video King, Skokie, IL .....	(312) 674 6502
Compuque-80, Houston, TX .....	&(713) 444 7041*
Compusystems, Columbia, SC .....	(803) 771 0922
Computer Connection, Beverly Hills, CA .....	(213) 657 1799
Computers for Christ, Ontario, CA .....	(714) 983 9923*
Creepy Corridors, Phoenix, AZ .....	(602) 956 5021-
CVBBS #1, San Diego, CA .....	(619) 691 8367*
CVBBS #2, San Diego, CA .....	!(619) 278 9114
Datamate, Canoga Park, CA .....	#1(213) 998 7992 so.
Diamond III, Phoenix, AZ .....	(602) 890 0972*
Dimension-80 Orange, CA .....	(714) 974 9788
Download-80 Mojo's, Forest Knolls, CA .....	&(415) 488 9145*
Dragon's Lair, Long Beach, CA .....	(213) 428 5206
Drummer, San Francisco, CA .....	(415) 552 7671 so.
EMC-80 St. Louis, MO .....	(314) 645 1047
Experimental-80 Kansas City, MO .....	(913) 676 3613
FBBS #1, Purdue, IN .....	&\$(317) 494 6643*
Future Tech, Alexandria, VA .....	!(703) 451 4893*
GBBSII Sullivan, CO .....	(303) 693 1064-
GBBSII Apple PI, Bloomfield, CO .....	(303) 469 7541*
GBBSII Aurora-Net, Denver, CO .....	(303) 343 8401*
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GBBSII Off The Wall, Boulder, CO .....	(303) 443 3367*
Genesys, Phoenix, AZ .....	(602) 967 4529*
Grape Line BBS, Napa Valley, CA .....	(707) 538 9124*
Hermes-80 Allentown, PA .....	(215) 434 3998
HEX Silver Spring, MD .....	%(301) 593 7033*
H&S Microsystems, Burnaby, B.C. ....	!(604) 430 4145-
IBM PC No-Name, San Lorenzo, CA .....	&(415) 481 0252*
INFOEX-80 West Palm Beach, FL .....	(305) 683 6044*
INFOEX-80 Akron, OH .....	(216) 724 2125*
INFOEX-80 Tulsa, OK .....	(918) 838 8698*
Interface BBS (Atari), Chicago, IL .....	(312) 296 3883
Irvine Line, Irvine, CA .....	(714) 551 4336
JCTS Redmond, WA .....	(206) 883 0403*
L.A. Interchange, Los Angeles, CA .....	(213) 631 3186*
Lethbridge Gaming system, Lethbridge, AB .....	(403) 320 6923
Living BBS, Education SIG .....	(415) 565 3037
Mages Inn, Omaha, NE .....	(402) 734 4748*
Magus, Herndon, VA .....	(703) 471 0611*
Mail Board-82 Seattle, WA .....	(206) 527 0897*
Masspet BBS, East Taunton, MA .....	!(617) 824 4878-
MBBS, Mission, BC, CN .....	!(604) 462 8633-
Micro-Com, Cincinnati, OH .....	!(513) 671 2753

Micro-Com, Louisville, OH.....	(216) 875 4582*
Micro-80 West Palm Beach, FL .....	(305) 686 3695
Micro Informer, Tampa, FL.....	(813) 875 3331
Microsystems, Phoenix, AZ.....	(602) 938 4508*
Midwest, St. Louis, MO.....	(314) 227 4312 so.
Mini-Bin Seattle, WA .....	(206) 762 5141*
MMMMMM#1, Santa Monica, CA.....	(213) 390 3239-so.
MMMMMM#2, New York, NY.....	(212) 541 5975-so.
MMMMMM#3, Marina del Rey, CA .....	(213) 452 6111-so.
MMMMMM#4, Lawndale, CA .....	(213) 821 2257-so.
Motherboard, San Leandro, CA .....	(415) 352 8442
MRC BBS, Mountain View, CA.....	!(415) 968 1093
NBBS Norfolk, VA .....	(804) 444 3392
North Orange Country Computer Club, Orange, CA .....	(714) 633 5240
Novation CO., Los Angeles, CA . . . <pass=CAT> .....	(213) 881 6880
Nibble One, Schenectady, NY.....	(518) 370 8343
NWLAIBMPCUG, Shreveport, LA .....	(318) 688 7078
NWWCUG Edmunds, Seattle, WA.....	(206) 743 6021
Nybbles-80, Queens, NY .....	(212) 626 0375
OACPM Omaha, NE.....	(402) 292 9598*
OARCS Portland, OR.....	(503) 641 2798
OCTUG Orange County, Garden Grove, CA .....	(714) 530 8226
Omega, Phoenix, AZ.....	(602) 952 2018*
Oracle North Hollywood, CA .....	(213) 980 5643 so.
Orange County Dta Exchange, Garden Grove, CA.....	(714) 537 7913
OS-9 6809 BBS, Palatine, IL.....	(312) 397 8308
PBBS Arc-Net, Little Rock, AR.....	(501) 372 0576*
PBBS Co-operative Comp Svc, Palatine, IL .....	(312) 359 9450*
Personal Msg. System-80, Deerfield Bch, FL .....	&(305) 427 6300*
PHOTO-80, Haledon, NJ .....	(201) 790 6795
PMBBS, Humble, TX.....	(713) 441 4032
RACS V Fullerton, CA .....	(714) 524 1228
RBBS Milwaukee-Chicago Line, IL.....	(312) 876 0974
RBBS The Meeting Place, Omaha, NE.....	!&(402) 734 6959*dl.
RBBS Upland, CA .....	!(714) 981 3787*dl.
RIBBS Houston, TX .....	(713) 497 5433
R.I.C.A.M.I.S., Kingston, RI.....	(401) 456 8250*
RI Tandy Users Group, Cranston, RI.....	(401) 944 4689*
RS-CPM Clarksville, MI .....	(616) 693 2648
SATUG BBS, San Antonio, TX .....	(512) 494 0285
Satyricon, Burnaby, BC, CN .....	!(604) 438 2468*
S.D.A.C.E., La Mesa, CA.....	!(619) 447 8143
Seacomm-80 Seattle, WA.....	(206) 763 8879*
SIGNON Reno, NV.....	<pw=FREE>.....(702) 826 7234
	\$(702) 826 7277
SISTER Staten Island, NY .....	(212) 442 3874*

SOBBS Poor Man's BBS, Houston, TX.....(713) 453 7931\*  
 SOBBS Test Mode, Houston, TX.....(713) 522 5516  
 Stellar III, Phoenix, AZ.....(602) 833 0740\*  
 Steve's BBS/Game Palace, Shawnee Mission, KS.....(913) 648 5301\*  
 Stuart II BBS, Boulder Creek, CA.....!(408) 338 9511\*  
 Sunrise Omega-80, Oakland, CA.....(415) 452 0350  
 Switchboard, Alexandria, VA.....(703) 765 2161\*  
 System/80 San Leandro, CA.....!(415) 782 4402  
 Talk-80 ROBB, Portsmouth, VA.....(804) 484 9636  
 TCUG BBS, Washington, DC.....(703) 836 0384\*  
 Tech-Link, Forest Glen, MD.....(301) 565 9051\*  
 TECOM-80, Tampa, FL.....(813) 839 6746  
 Telcom 7 New Fairfield, CT.....(203) 746 5763\*  
 Telemesssage-80, Atlanta, GA.....(404) 962 0616  
 The Garden of Eden, Phoenix, AZ.....(602) 991 0144\*  
 The Interface, Los Angeles, CA.....(213) 477 4605  
 The Software Bank, Northridge, CA.....!(213) 701 7670  
 Toledo Apple Users BBS, Toledo, OH.....!(419) 537 9777\*  
 Treasure Island, Royal Oak, MI.....(313) 547 7903  
 TVG Systems, Burnaby, BC, CN.....!(604) 738 1640\*  
 Vanmil, Milwaukee, WI.....(414) 271 7580\*  
 VERGA 80, Santa Ana, CA.....(714) 547 6220  
 Voyager, Phoenix, AZ.....(602) 247 6034  
 Vic-20 Online, Houston, TX.....(713) 944 6597\*  
 Visiboard, Wellesley, MA.....(617) 235 5082  
 WAPABBS, Charlotte, NC.....(704) 373 7966\*  
 Westside Download, Detroit, MI.....!(313) 348 4479  
 XIO, Houston, TX.....(713) 495 1422-/ex



# Glossary

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**acoustic coupler**—A cradle device used to connect the telephone receiver to the computer.

**A/D**—Analog-to-digital converter. A circuit that translates an analog signal into digital quantities.

**ampersand routines**—Machine language software routines called from an Applesoft program by means of the "&" command. This command allows for the passing of a number of parameters back and forth between Applesoft and machine language programs. These parameters select which of a variety of functions will be performed and in what manner they will be performed. Most light pen software is driven by a series of ampersand routines.

**analog**—Any process that changes steadily and may appear irregular and sudden, but never instantaneous.

**analog touch tablet technology**—A touch tablet that uses analog technology returns a value between 0 and 255, depending on where pressure is being placed on the tablet.

**answerback**—The specific character (or two) from a computer indicating it is ready for data transmission. This character can be typed in manually by the operator, or it can be an automatic feature of the modem.

**application**—The end user tasks which utilize specifically designed software, such as a database program to perform inventory control.

**ASCII code**—American Standard Code for Information Interchange. The code assigns a specific number (between 0 and 127) to each of 128 numbers, upper-

and lowercase letters, special characters, and control codes. The ASCII code is used on the Apple II family of computers, as well as most other microcomputers and peripheral devices.

**auto-answer**—A feature on some modems which automatically answers and responds to incoming calls.

**auto-dial**—A feature on some modems for automatically dialing an information source.

**auto-line feed**—A printing mode in which a line feed is also executed each time the printer executes a carriage return. This feature prevents overprinting of data.

**backup**—A duplicate copy of a program or data stored on a different diskette or tape in case of loss or damage to the original.

**bandwidth**—The maximum rate at which a monitor or television set can accept data from the computer. It is measured in megahertz.

**battery backup**—A rechargeable battery is supplied with some RAM cards so that the data on the card is not lost in the event of a power failure.

**baud rate**—The speed at which information is transferred between devices, measured in bits per second.

**BDOS**—Basic Disk Operating System. One of three components of CP/M, it manages disk files, file storage, retrieval, and allocation.

**beam convergence**—The precise meeting of the beams that strike the pixels.

**Bell 103**—A low-speed modem developed by Bell Laboratories.

**Bell 212A**—A high-speed modem developed by Bell Laboratories.

**bidirectional**—Indicates that the print head prints in both directions. A typewriter prints only in one direction.

**BIOS**—Basic Input/Output System. One of three components of CP/M, it facilitates exchange of data and status information between the console command processor and a peripheral device.

**block graphic characters**—Larger than normal characters for headings, titles, etc.

**bps**—Bits per second.

**BSR interface**—A connection between the computer and a BSR controller. The BSR controller, using existing household wiring, can turn on and off appliances and lights using command modules which are installed in your house. A BSR interface on a clock card permits you to turn on and off appliances at specified times.

**buffer**—A memory device that stores data until the printer is ready to print it. The buffer is located within the printer, the printer interface, in a separate unit, or as part of the computer's RAM.

**bulletin board**—An information source providing local information.

**cache memory**—A high-speed buffer used jointly by the computer and the hard disk. The hard disk achieves a faster average access by holding data in its cache memory in case it is needed again. Some cache memories also use a read-ahead and exchange that attempts to read data into the cache memory before it is requested by the computer. This can speed up access to sequential or partially sequential data.

**cassette**—A device which permanently stores data. It requires a recorder which plugs into the cassette port on the Apple II, II+, or IIe. Information is transferred sequentially, and it is therefore much slower.

**catalog**—A listing of each file and program on a diskette.

**cathode ray tube (CRT)**—The television or monitor tube used to display images or characters.

**Centronics parallel**—A type of parallel data transmission standard which is used in many printers and other devices. See parallel.

**CCP**—Console Command Processor. One of three components of CP/M, it is user interactive (interprets commands from the keyboard) and performs internal processing using BIOS and BDOS.

**character generator**—The section in ROM memory that contains information and instructions needed to create characters on the screen.

**chroma line**—The path along which information for creating images in color is sent to the computer.

**CMOS chip technology**—A method of creating silicon chips using Complementary Metallic Oxide Semiconductor technology. CMOS chips use less electrical power than other types of chips and thus run cooler and with less strain on the power supply.

**colored text**—The display of text on a color monitor screen in a color other than white. This feature is only found in RGB output on the Apple. It can be simulated through high-resolution graphics text commands, although it is normally limited to 40 columns in this form.

**composite video**—A type of color monitor where information for the images is sent to the computer through only one line, the chroma line.

**compressed print**—A print mode where the width of characters is reduced.

**contrast**—A knob on the monitor to vary the difference between the light intensity of the image and its background.

**control character**—Any character which has been given a specific purpose, like beginning or ending the transmission of data or responding to an incoming call.

**correspondence mode**—Available on some dot-matrix printers, this mode enables you to print letter-quality material. The quality of the print depends on the printer.

**CP/M**—Control Program for Microcomputers. A single-user, disk-based operating system designed for the Z-80 and 8080-based microcomputers, originally developed by and licensed to Digital Research. There are two versions of CP/M commonly available for the Apple: CP/M version 2.2 and CP/M 3.0 (CP/M Plus). Many CP/M programs will run under either version of the operating system.

**cps**—Characters per second.

**D/A**—Digital-to-analog converter. Converts digital signals to analog signals.

**daisy-wheel printer**—A printer that uses a printing element resembling a daisy. Each character is at the end of a spoke. The wheel spins and is pressed by the hammer when the proper letter is in front of the hammer.

**date and time stamping of files**—Saving the date and time along with the filename in the disk directory. The date can be displayed with the catalog of files on the disk.

**data communication**—Transmitting and receiving data to or from remote systems.

**data transfer rate**—The rate at which data is transferred from one place to another, such as disk to memory. Often expressed in bits per second.

**DB-5 and DB-25**—Connectors for 5- and 25-wire data busses, respectively.

**descenders**—The bottom portion of lowercase characters which are below the print line. On a 5- $\times$ -7 matrix, upper- and lowercase letters use the top seven rows of dots. The letters with descenders need rows eight and nine to appear fully formed. On a 5- $\times$ -7 matrix descenders are all above the print line and appear odd.

**digital**—Combinations of discrete binary units, as contrasted with representation by a continuously changing function.

**digital recording**—Recording sound from sound-intensity samples, represented by discrete multiples of unitary value.

**digital touch tablet technology**—A touch tablet which uses digital technology returns an on/off signal for each location on the tablet. It is able to report several locations on the tablet being pressed at the same time.

**DIP switches**—A series of switches which are inserted into an electrical circuit. Each switch has a separate on/off position. The pins on the switches are in the same configuration as the pins on DIP chips. DIP stands for dual in-line packet and refers to the fact that the pins are arranged in two parallel lines.

**direct connect**—Indicates the modem is connected directly to the computer.

**disk**—Also called diskette, a flat, flexible mylar device on which data is recorded magnetically.

**disk drive**—The peripheral device used to either record onto a disk or read data from the disk.

**DOS**—Disk Operating System. A set of programs used with a disk drive, which tells the central processor how to communicate with all the peripherals connected to the computer.

**dot pitch**—The amount of space between the holes in a color CRT's shadow mask.

**dot graphics**—The number of dots per inch a device is able to produce. The more dots per inch, the better the graphics resolution.

**dot matrix**—A method of forming characters by using a rectangular matrix of dots. Characters are created progressively, rather than all at once.

**double density**—Indicates that the storage medium is capable of storing twice the amount of data as a single disk or other medium.

**double sided**—Indicates that both sides of the disk are capable of storing data.

**double strike**—A print mode where a character is printed twice—one character on top of the other. The resulting character appears darker and sharper.

**dpi**—Dots per inch.

**dumb card**—A printer card which merely transfers each byte of data out to the printer, without any formatting or other modification.

**Dvorak keyboard**—A keyboard layout designed for greater efficiency in typing, placing the most-used keys closest to the fingers of the hand. It is a built-in option on every Apple IIc.

**electron gun**—The device that shoots the beam through the tube to the screen.

**EMI**—Electro Magnetic Interference.

**emphasized graphic dump**—To increase the darkness of a printed graphics picture, some cards permit double striking of each dot.

**emphasized print**—A print mode where a character is printed once, and then again slightly to the side to give the character the appearance of being emphasized.

**EPROM**—Eraseable, programmable, read-only memory; a chip which holds programs which are normally not changeable. The programs on the EPROM can be erased using special ultraviolet light erasers and then reprogrammed using a prom burner.

**error message**—A message displayed on the screen to inform the user that some problem has occurred while the drive was functioning.

**escape sequences**—A series of command codes generally starting with ASCII code 27.

**expanded print**—A print mode where characters are spread out, and the actual width of the character is increased.

**expansion board modem**—Indicates the modem is installed inside the computer. Also called an internal modem.

**external**—A term used to describe a hard disk that has its own cabinet and is not located inside the computer console. It is attached to the computer by an external cable.

**fanfold paper**—Continuous sheets of paper joined by perforations and folded in a zig-zag fashion. The paper runs through the printer and folds by itself.

**FET**—Field Effect Transistors.

**fill/draw software**—Programs that permit the drawing of shapes on the graphics screen using the appropriate pointing device and the filling in of closed shapes with colors or patterns.

**filter**—A device used in telecommunications. It allows signals of specific frequencies to pass without significant attenuation, whereas other frequencies are strongly attenuated.

**firmware**—A program on a ROM, PROM, or EPROM. So called, to differentiate it from software, which is more readily modifiable.

**fixed disk**—A hard disk.

**fixed media**—Media that cannot be removed from the device. Hard disks use fixed media.

**flat membrane keyboard**—A keyboard consisting of a pressure-sensitive thin medium placed between two sheets of plastic. Pressing a location on the membrane generates an electrical signal to the keyboard controller indicating where the membrane has been pressed.

**floppy**—Refers to the flexible mylar disk used for mass storage.

**font**—Style of characters (i.e., Roman Gothic, Courier).

**format**—A technique for labeling the file marks, track marks, address marks, check sums, and headers on a disk. Formats are not the same in each system, and a disk must be formatted before it can be used to store data or programs.

**format synthesis**—Simulates electronically simple frequencies and then modifies them, through filters, to simulate complex sounds. Depending on the nature of

the material vibrating, different objects emphasize particular harmonics over others. Harmonics are integral multiples of primary frequency, and the dominant harmonics are called formats.

**form feed**—A button on some printers to automatically advance the paper to the top of the next page. It can also sometimes be activated by sending ASCII code 12 to the printer.

**friction feed**—A means to feed paper into the printer using pressure against the roller. Typewriters function in this manner.

**full duplex**—The ability of the modem to send and receive information simultaneously.

**function key**—When a standard key on a keyboard is pressed, it generates a single ASCII code representing its particular character. A function key, however, generates a string of ASCII codes, which results in a command to the computer to carry out a particular function.

**game port extender**—A small device which inserts into the Apple game port or socket and permits plugging in more than one device in the game port at one time. Only one device can however, normally be used at any one time.

**graphics dump**—A program for printing the picture from a graphics screen. Resolution types are low, high, and double.

**grid**—A pad which sits on the work surface next to the computer. It is usually made out of plastic or metal and measures approximately 12 × 12 inches. This surface is covered with lines which are read optically by the mouse. An optical mouse uses these lines to calculate the distance it is moving and its current position in relation to the screen.

**half duplex**—The ability of the modem to either send or receive data, but not at the same time.

**handshaking**—A basic communication technique between a printer or other peripheral device and the computer indicating its readiness to accept data.

**hard-sectored**—Indicates that the recording surface of the disk is permanently marked by sectors.

**harmonic**—A sinusoidal wave, whose frequency is a multiple of the fundamental frequency, which determines the tone or quality of sound.

**highlight/lowlight**—A video display using two different intensities of light. The standard Apple display screen is capable of only one intensity and, therefore, different intensities are indicated using inverse (black on a white/green/amber background) or flashing (alternating normal and inverse). Wide display cards, which are capable of dual intensity, often require special chips.

**high-persistence phosphor**—The light on a video display terminal is created by a phosphor dot, which glows when struck by an electron beam. Phosphor dots fade after removal of the electron beam stimulus. Dots which take a long time (in relative terms) to fade are called high-persistence phosphors.

**high-resolution mode**—The ability of the computer to individually program and display highly detailed graphics.

**horizontal**—A line parallel to the horizon.

**horizontal register**—A register that, when activated by a signal from the light pen, latches in the horizontal location of the electron beam.

**horizontal scrolling**—If a display line is wider than the display screen (normally 80 columns in an Apple running CP/M), horizontal scrolling is used to display different parts of the line as the cursor moves across the line. This is accomplished by shifting the text on the screen from left to right or right to left, displaying the text previously “just off” the screen.

**IEEE**—An industry standard communications protocol, often referred to as IEEE-488, which allows parallel data transmission between multiple devices, each identified by a unique identification number.

**IF-THEN-ELSE**—A form of the IF command in BASIC. The format of the command available in almost every form of BASIC is IF . . . THEN. The BASIC language evaluates the IF statement and, if true, executes the THEN statement. Where the ELSE part of the command is available, it is executed if the IF statement evaluates false. IF-THEN-ELSE is not available in Applesoft.

**input device**—Any item of equipment which permits data and instructions to be entered into a computer’s central memory, i.e., keyboards, terminals, joysticks, and light pens.

**interface**—A device used to connect the computer and a printer or other peripheral. This connection is through a serial or parallel port. All parts of this connection must be compatible.

**interlacing**—A technique for increasing the resolution of the display screen by refreshing only every other line for each refresh of the screen.

**internal**—A term used to describe a hard disk drive that inserts into the main console of the computer.

**interrupt**—An electrical signal to a computer indicating that some event has occurred. For networks, the event is typically a request from another unit in the network to send or receive data. The signal tells the central processor to save its position in the currently running task and execute the code from the interrupt handling routine. Following the execution of this routine, the processor goes back to the original program at the place it was interrupted.

**inverted**—In printing a graphics picture, the process of printing each white dot as black instead of each black dot as black.

**jumper**—A cable used to provide the proper timing signal to the RAM card to periodically refresh the memory on the card.

**keypad**—A grouping, in a rectangular arrangement, of number keys and in some cases, other function keys. The configuration is similar to that of an electronic calculator.

**key repeat**—A function that repeats the code it sends at a specified rate when the key has been held down for a specified period of time.

**letter quality**—Indicates that the characters printed appear fully formed, as on a typewriter, and the print could be used for more important documents.

**linear predictive coding**—A technique for analyzing speech and converting it into digital code.

**line feed**—A button on some printers to automatically advance the paper one line.

**load**—A term indicating the transfer of data from storage (disk or tape) into the computer's memory.

**logic-seeking**—A feature which examines the content of the next line or two to determine whether to return the carriage or wait to print the following line backwards across the page.

**loopback**—A test to see if the modem is correctly transmitting data.

**low-pass filter**—A wave filter that allows those frequencies below a certain critical frequency to pass and excludes all those above that point.

**matrix size**—Each letter displayed on the screen consists of a series of dots. The rectangle or square available for display of a letter is called the matrix. The greater the number of dots within the matrix, or the greater the matrix size, the more refined the letter can be.

**megabyte**—1 million bytes or 8 million bits.

**memory expansion**—The use of a RAM card to make the computer able to address a larger amount of memory.

**mirror drawing**—A form of drawing used mainly by light pens in which each movement of the pen is mirrored in another section of the graphics screen.

**modem**—MODulate/DEModulate. The device that modulates digital signals into analog signals and demodulates analog signals into digital signals.

**modulation**—Converting steady states to frequencies.

**monitor**—The screen used to display images generated by the computer.

**monochrome**—Using one color or shades of one color.

**motherboard**—The main circuit board of the Apple II family of computers. In the Apple II, II+, and IIe, the motherboard contains a variety of slots and sockets into which peripheral devices can be plugged. On the Apple IIc, the motherboard is inside the sealed case, and peripheral devices are plugged into the ports on the back of the case.

**MOV**—Metal Oxide Varistor. A component used in line filtering devices to protect against surges. Its effectiveness diminishes with use.

**MTBF**—Mean Time Between Failures. Used to measure the effectiveness of a battery between power failures.

**multiplexer**—A device that accepts low-speed input from a number of different terminals and gathers them into one stream of high-speed data, which is then simultaneously transmitted on a single channel. At the end of the line, a demultiplexer converts this data back into low-speed input.

**network**—A group of computers which communicate over telephone lines or other air waves.

**nonvolatile memory**—A special type of RAM which can be read from or written to, and modified, but which holds its value even when electricity is not supplied to it.



**noise**—Refers, in telecommunications, to unwanted (usually random) electronic signals.

**normal pitch**—Ten characters per inch.

**on line**—Indicates that the printer is connected, and data can be sent, as opposed to off line, which indicates that the printer is not ready to receive data for some reason.

**operating system**—Software contained in a computer's ROM or on disk that allows it to control the sequencing and processing of programs, and so respond correctly to user requests. It also facilitates communication between the CPU, the data in memory, the keyboard, and peripheral devices.

**output device**—Any device capable of receiving information from a central processor. It may be some form of backing storage, or a peripheral unit which "translates" information into another medium.

**overscan**—The tendency of a video display unit to place part of the display in an area of the picture tube which is not normally viewable.

**page 1/page 2**—There are two display screens on the Apple II family of computers, whether for text, low-resolution graphics, or high-resolution graphics. The normally displayed screen is referred to as page 1, and the other screen, which can be displayed by special means, is referred to as page 2.

**paper out light**—Indicates the printer is out of paper. The printer will usually stop at this point until the paper is replaced.

**parallel**—The process of transferring data one byte at a time over seven or eight parallel data wires.

**parity**—A means of ensuring data integrity when data is transmitted serially. The parity bit is set to either 0 or 1, depending on whether an odd or even number of 1 bits were sent and whether parity is set to odd or even parity.

**Pascal date**—The UCSD p-System for the Apple stores the system data in a memory location where it can be accessed by different functions. Whenever a file is saved, the operating system saves the system date together with the filename in the disk directory.

**phosphor persistence**—The glow duration after electrons stop striking a point on a CRT screen.

**pin feed**—A method of feeding paper which uses pins on either side of the roller to carry paper with holes along the side (sprocket paper).

**pixel**—The smallest element of an image on a CRT screen; the basic unit which makes up a scan line.

**port**—An input/output connection on a computer that facilitates the direct connection of a peripheral.

**printer control codes**—Special codes that the printer interprets as instructions rather than characters to print.

**PRINT USING**—A form of the PRINT command in the BASIC language which permits formatting of the output before it is displayed on the monitor screen or printed by the printer. PRINT USING is not available in Applesoft.

**print wheel**—A generic term for a type of character-printing device such as a daisy wheel or thimble.

**program listing**—A printout of the source code of a computer program. It often includes diagnostic aids and charts.

**programmable keys**—Most, if not all, keys on a keyboard have functions or characters already supplied to them. In most cases these characters or functions cannot be changed. A programmable key, however, can have user-defined characters or functions supplied to it or changed, subject usually to a maximum number of characters to be applied to any one key.

**protocol**—The format and procedures used to control the exchange of data between devices.

**quad density**—Indicates the disk is capable of storing four times the amount of data as a single disk.

**QWERTY keyboard**—The standard American typewriter keyboard layout (also known as the Sholes keyboard) named for the first six letters of the first letter row of the keyboard.

**RAM disk**—The use of part of the available RAM in the computer, either in main memory or on an auxiliary RAM card, to make the computer appear as a super-fast disk drive. Data saved on the RAM disk must be transferred to a more permanent floppy disk before power is turned off, or the contents of the RAM disk will be lost.

**random access**—A technique for going directly to a particular item (address) in memory without having to start at the beginning and go through each item in sequence.

**raster scan**—The technique of creating images by a beam repeatedly passing across the screen.

**read**—To sense the data which has been recorded on a disk or other storage medium so that it can be copied.

**refresh rate**—The length of time it takes the CRT's electron gun to scan the entire screen.

**release**—The amount of time required for a sound to become silent from a mid-range intensity.

**remote database**—An information source which can be accessed only with a modem or other telecommunications equipment.

**removable media**—Media, such as diskettes, cartridges, and cassettes, that can be removed from the device.

**resolution**—Directly related to the number of pixels on the screen surface. A high-resolution monitor has many more addressable pixels than a low-resolution monitor. A more intricate and detailed image can be produced with more pixels; however, resolution is also affected by the software and the overall quality of the monitor.

**resonance**—The condition of a circuit in which the capacitive and inductive-reactance components are equal. This condition is attained only for a comparatively

narrow band of frequencies for given component values and propagated through any medium capable of vibrating.

**RGB**—Red, Green, Blue. A type of color monitor which uses three signals to control three electron guns, instead of one.

**rigid disk**—A synonym for hard disk.

**RS-232C**—The name of the electrical standard for serial data communication between devices. This type of connection is widely used in modems and some other input/output devices.

**rubber band lines**—A technique of graphics drawing in which the potential line or shape is shown on the screen in a moving line which is set down on the screen when a button is pressed on the drawing device.

**save**—To permanently store data onto a disk or other medium.

**screen dump**—A program for transferring either the text or graphics screen to the printer.

**screen resolution**—Indicates the amount of pixels a screen is able to display.

**sector**—A section of the track on a disk.

**self centering**—The ability of a joystick, through the use of springs, to return to the center location (corresponding to X and Y, each approximately equal to 127).

**self-test**—A procedure whereby a device verifies whether or not it is working properly and notifies the user appropriately.

**sequential access**—A method of scanning data, starting at the beginning of the data.

**serial**—Transmission of data where one wire is used to send one bit at a time. A serial device must collect all eight bits to form one byte.

**shadow mask**—A perforated filter set behind the screen through which the beams pass on their way to the pixels.

**shift key mod**—A one-wire attachment to the Apple II and II+ which connects the output of the shift key to the game I/O port annunciator. Programs can then read the status of the shift key to determine if it is pressed. The shift key mod is not needed on the Apple IIe and IIc, which have a shift key that functions as on a normal typewriter.

**single-sided**—Indicates that only one side of the disk is capable of storing data.

**slew rate**—The speed which the print head moves to the next line; usually measured in lines per second.

**soft-sectored**—Indicates that the recording surface of the disk is marked magnetically at the beginning of each sector.

**softswitch**—The ability to switch the status of a given output or input from one place to another by giving a software command.

**sound envelopes**—A series of specifications which detail how quickly a musical tone reaches full volume, how long it retains that volume, and how quickly and how far it lowers in volume, all during the period of the note.

**stand-alone modem**—Indicates the modem is a separate unit. Also called an external modem.

**standard mode**—The ability of the computer to generate characters or images

which have already been established in Read Only Memory (ROM).

**storage**—A synonym for memory, which is usually expressed in bytes.

**subscript**—Characters reduced in size and printed slightly beneath the print line.

**superscript**—Characters reduced in size and printed slightly above the print line.

**telecomputing**—Using telephone lines to send and receive data between two computers.

**terminal emulators**—Communications software that enables you to type information from the keyboard and send it through the modem.

**text dump**—A program for transferring the text screen to the printer.

**text-to-speech algorithm**—An algorithm that uses a variety of rules to translate the English text to sounds which approximate how the word actually is spoken.

**thumbwheel potentiometer**—A small wheel, normally turned with the thumb, that is soldered to a printed circuit board and varies the resistance of the component to which it is attached, often a volume control.

**tied notes**—A musical term which specifies that two or more notes which are normally played distinctly, that is, with a gap between them, should be played continuously without any noticeable gap.

**timesharing**—Dividing the computer's processor between several users who share the processing time.

**TPA**—Transient Program Area. An area of memory in CP/M allocated for loading user programs and storing data.

**tracks**—The concentric rings on the disk surface.

**tractor feed**—A method of accurately positioning and moving fanfold paper through the printer. Perforations along the edge of the paper fit over the sprocket wheels.

**transfer point**—The voltage (approximately 108 V) at which a standby power system starts supplying power to the computer.

**transparent**—Indicates the computer rather than the end user takes care of data transmission.

**trim tabs**—Slide switches on some joysticks which adjust the reading of the potentiometers so that the values returned lie within the normal expected values.

**triplet notes**—A musical term which specifies that three notes are to be played during the time interval normally specified for two.

**true descenders**—The lower part of lowercase letters (g, j, p, q, and y) which extend below the normal print line is called a descender. In displays with a matrix size sufficiently large, these letters can be displayed with their descenders extending below the print line, rather than elevated.

**type-ahead buffer**—A device that stores the keys pressed in a particular memory location, either in the computer (program type-ahead buffer) or in a special location (hardware type-ahead buffer) until the operating system can get around to handling the keys.

**UPS**—Uninterrupted Power System. A unit to protect you from blackouts, which cause loss of material and damage to the computer.

**VA**—Volt Ampere. A method used to measure the maximum output of a standby

system. To convert this to watts or amps, add up the individual amp readings of all devices to be powered and multiply by 120.

**VDU**—Video Display Unit. Another name for the screen, which applies to both monitors and televisions.

**video controller**—The device which organizes the video information in the computer and sends it from the computer to the monitor.

**vertical register**—A register, when activated by the signal from a light pen, that latches in the vertical location of the electron beam.

**voice**—A distinct musical tone produced by a music card.

**white noise**—A series of apparently random sounds.

**windows**—The superimposing of text, in a defined rectangular frame or window, over previously existing text. After viewing or taking appropriate action with the superimposed text, you can return to the previous text which has not changed. Windows also refer to two frames on the same screen and the ability to switch between them.

**workstation**—The computer console, screen, and keyboard used by an individual to perform tasks. Each workstation is attached via cable to a central interface, which allows them to share peripherals, data, and software.

**write**—To store data onto a disk or other permanent storage medium.

**write-protect**—To ensure a disk is not erased by placing an adhesive tab over the notch on the disk.

**XON/XOFF protocol**—A handshaking protocol used to indicate when data is ready to be transferred and when it is not.

# Index

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## A

AJS200 joystick, 216  
Alphabits printer interface, 92-93  
Alphacom 81 printer, 24-25  
ALS CP/M Card, 238  
Amdek Color 400 monitor, 125  
Amdek Color 500 monitor, 125-126  
Amdek Color 600 monitor, 126-128  
Amdek Color 710 monitor, 128  
Angel Buffer, 249-250  
AP-100 Drive, 162  
AP-105 Drive, 162  
AP-110 Double Drive, 162-163  
AP-120 Disk Controller card, 163  
AP-830 serial-to-parallel converter, 94  
APIC printer interface, 93-94  
Apple 80-column card, 150-151  
Apple Cat II modem, 111-112  
Apple daisy wheel printer, 64-65  
Apple Disk IIc disk drive, 160  
Apple Disk IIe disk drive, 160  
Apple II family, 5-9  
Apple Joystick, 216  
Apple Modem, 113-114  
Apple Mouse II, 217-218  
Apple Numeric Keypad II, 229  
Appli-Card coprocessor, 238-239  
APS-M Drive, 163-164

ASCII data format, 90  
Au 9191 U monitor, 129  
Auto answer, 109  
Auxiliary slot, 5  
Axlon RAMdisk, 193-194

## B

B-700 hard disk, 180-181  
Backup methods, 178  
Backup sites, 178  
Bandwidth, 123  
Basic input output system, 237  
Baud, 108-109  
BDOS, 237  
Bidirectional printing, 23  
BIOS, 237  
Buffers, 246  
Buffers, printer, 21  
Built-in self test, 109  
Busy mode, 109

## C

C-111 disk drive, 164  
C-130 disk drive, 164  
CCP, 237  
Centronic interface standard, 91  
Centronics parallel interface, 22  
Character pitches, 63  
Character set, proportional, 20  
Character set, standard, 20

Clocks, 198-203  
Color I monitor, 129-130  
Color monitors, 123  
Command abort, 109  
Command mode, 109  
Command recognition, 110  
Compatible, 4  
CompuServe Information Service, 111  
Console command processor, 237  
Controller/buffers, 246-247  
Corona Starfile hard disk, 181  
Correspondence mode, 23  
CP/M disk operating system, 237  
CP/M Gold Card, 239-240  
CP/M Plus, 239  
CPI, 20  
cps, 62  
CR-4500 monitor, 130-131  
CR-5600 monitor, 131-132  
CR-6500 monitor, 132-133  
CR-II printer, 65-66  
CR-III printer, 66-67  
Cricket sound card, 205  
CRT, 122

## D

D-100 printer, 25-26  
D-200 printer, 26-28  
D-300 printer, 28-29

Daisy-wheel printers, 62-63  
 Datasaver standby power system, 250-251  
 DataShield Backup Power System, 252  
 DataShield Model 100 surge protector, 251-252  
 DB-25 connector, 91  
 DD Controller card, 165  
 Delta 10 and 15 printers, 29-31  
 DES 2000 security system, 254  
 Diablo 630 ECS printer, 67-68  
 Dial tones, 110  
 Dialing directory, 110  
 Dialog's Knowledge Index, 111  
 Digital Electric Hard Disk, 181  
 Direct connection of a modem, 109  
 Directory modification, 110  
 Disk, 159  
 Disk drive operation, 158-159  
 Disk drives, 158-176  
 Disk formatting, 159  
 Disk server, 179  
 Diskettes, 159  
 Dispatcher printer interface, 94-95  
 Distar disk drive, 165  
 Distar DuoDrive, 165-166  
 DMP-29 plotter, 255  
 DMP-40 plotter, 255-256  
 Documentation rating, 17  
 Dot pitch, 122  
 Dot-matrix printers, 20-61  
 Dot-matrix printers, types of, 22-23  
 Dow Jones News/Retrieval, 111  
 Downwardly compatible, 4  
 Duodisk drive, 166  
 DVM-80e RGB card, 144  
 DX-15 printer, 68-70

## E

E-Z Card, 240-241  
 Ease of installation rating, 17  
 Echo+ sound card, 206  
 Elite 1 disk drive, 166-167  
 Elite 2 disk drive, 167-168  
 Elite 3 disk drive, 168-169  
 Elite Controller card, 169  
 Emphasized mode, 23  
 Englebart, Douglas, 214  
 Enhancer II keyboard modification, 229-230  
 EPS keyboard, 230-231  
 eRAM 80 wide display card, 151  
 EXP-500 printer, 70-71  
 External modem, 9

## F

F-10 Printmaster printer, 71-72  
 F-10 Starwriter printer, 72-73  
 Features, 16  
 File server, 179

Formatting the disk, 159  
 Full-duplex, 109  
 Fully-formed-character printers, 62-89  
 Function keys, programmable, 227  
 FX-80 and FX-100 printers, 31-33

## G

Game controllers, 212  
 Gemini 10X and 15X printers, 33-34  
 Gibson Light Pen, 218-219  
 Graphiccard printer interface, 95  
 Graphics dump capability, 92

## H

Half-duplex, 109  
 Hamlet serial-to-parallel converter, 95-96  
 Hard disk 5 + 5, 187  
 Hard disk, 5MB, 186  
 Hard disk drives, 177-187  
 Hardware selection process, 18-19  
 Hayes Micromodem II//e, 114  
 Hayes Smartmodem 1200, 116  
 Hayes Smartmodem 300, 115-116  
 Help command, 110  
 Hex dump mode, 51  
 HR-25 printer, 73-74

## I

Imagewriter printer, 35-37  
 Impact printer, 23  
 Infax 101A hard disk, 182  
 Information services, 110-111  
 Ink-jet printer, 23, 63  
 Interface, 1  
 Interface, printer, 21-22  
 Interfaces, monitor, 124  
 Interfazer controller/buffer, 256-257

## J

JB-1260MA monitor, 133  
 Juki Model 6100 printer, 74-75

## K

Key Tronic KB200 keyboard, 232  
 Keyboard enhancers, 228-229  
 Keyboard replacements and enhancements, 227-235  
 Keyport 717 specialty keyboard, 231  
 Keywiz VIP specialty keyboard, 232-233  
 KoalaPad, 219-220  
 Kraft Joystick, 220  
 KVA II Multi Function numeric keypad, 233

## L

LANs, 179  
 Laser printer, 23, 63  
 Last number redial, 110

Legend RAMcard, 194  
 Lemon/Lime/Peach/Orange surge protectors, 257  
 Light pens, 213-214  
 Line noise, 247  
 Line printer, 23  
 Local Area Networks, 179-180, 187-191  
 LQ-1500 printer, 37-38

## M

Mach III joystick, 221  
 Magellan Light Pen, 221-222  
 Manual dial, 110  
 Matrix, 23  
 MC1 sound card, 206-207  
 MC16 sound card, 207-208  
 Mechanical mouse, 215  
 Megahertz, 123  
 Memory Master //e wide display card, 151-152  
 Micro-UPS, Model 3056, 261  
 Microbuffer II printer interface, 97  
 Microbuffer II+ printer interface, 96-97  
 Microbuffer In-Line Buffer, 259  
 Microbuffer/E buffer interface card, 258  
 Microfazer buffer, 259-260  
 Microline 82A and 83A printers, 39-40  
 Microline 84 Step 2 printer, 40-42  
 Microline 92 and 93 printers, 42-44  
 Mini UPS battery, 262  
 Minicomputer Regulator Super Isolation Transformers, 261-262  
 MiniTaur disk drive, 169-170  
 Mochinon Drive, 171  
 Mockingboard sound card, 208  
 Modem features, 109-110  
 Modem register contents, 110  
 Modem switches, 110  
 Modem, external, 9  
 Modulator-demodulator, 108  
 Monitor, 122  
 Monitor buying tips, 124  
 Monitor //c, 134-136  
 Monitor //e, 133-134  
 Monitor interfaces, 124  
 Monitors, color, 123  
 Monitors, monochrome, 123  
 Monitors, tv, 123-124  
 Monochrome monitors, 123  
 Mouse, 214-215  
 Mouse, mechanical, 215  
 Mouse, optical, 215  
 MousePaint, 218  
 MT 160L and MT 180L printers, 44-46  
 Multiport Controller/Buffer Model 524, 263

## N

Name selection dialing, 110  
NEC 2050 Spinwriter printer, 76-77  
NEC 3550 Spinwriter printer, 77-78  
Networker modem, 117  
Nice Print printer interface, 97-98  
NLQ mode, 27  
NTSC, 143  
Number linking, 110  
Numeric keypad, 227

## O

Off-line UPS, 248  
Olympia Electronic Compact RO printer, 79-80  
Olympia ESW 3000 printer, 78-79  
OMNIDRIVE hard disk, 182-184  
OMNINET LAN, 187-188  
Operation of disk drives, 158-159  
Optical mouse, 215  
Originate Only, 110  
Originate/Answer, 110  
Overstrike mode, 23

## P

Pace 2-in-1 Drive, 172  
Pace AP Half Height disk drive, 171-172  
Pace AP Standard Drive, 171  
Paddlesticks, 222  
Paper, 21  
Parallel Interface Card *II*e, 98-99  
Password modem, 117-118  
Peripherals, 9-10  
Peripherals, specialized, 246-269  
Phantom slot function, 102  
Phonemes, 205  
Phosphor persistence, 122  
Pi 1, Pi 2, Pi 3, and Pi 4 monitors, 136-137  
Pixels, 122  
Pkaso/U printer interface, 99  
PLAN 4000 LAN, 188  
Plotters, 247  
Pointing devices, 212-226  
Potentiometer, 212  
Power Line Monitor, 264-265  
Power Pad, 222-224  
Power protection devices, 247-248  
Power Type printer, 80-81  
Powermaker Micro UPS, 265-266  
PPW Drive, 172-173  
Premium SoftCard *II*e, 241-242  
Price/performance rating, 17  
Princeton HX-12 monitor, 137-138  
Print effects, 63  
Print functions, 63  
Print-It printer interface, 101-102  
Printer buffers, 21  
Printer function and use, 22  
Printer interfaces, 21-22

Printer pitch, standard, 20  
Printer ribbons, 21  
Printer speeds, 23  
Printer, daisy-wheel, 62-63  
Printer, impact, 23  
Printer, ink-jet, 23, 63  
Printer, laser, 23, 63  
Printer, line, 23  
Printer, thermal, 23  
Printer, thimble, 63  
Printerface printer interface, 100  
PrinterMate printer interface, 100-101  
Printers, dot-matrix, 20-61  
Printers, fully-formed-character, 62-89  
Pro Series hard disk, 183-184  
ProClock, 199-200  
Product selection for review, 16-18  
Profile hard disk, 183  
Programmable function keys, 227  
ProModem 1200A, 118  
Proportional character sets, 20  
Protocol, 21  
Protocol detect and switch, 110  
PSIO printer interface, 102-103  
Push tip light pen, 213

## Q

Q-5000 hard disk, 184-185  
Qantex 7065 printer, 48-49  
QC10 hard disk, 184  
Quadjet printer, 46-47  
Quit command, 110

## R

Radio frequency modulator, 124  
RAM, 2  
RAM cards, 192-197  
Rating system, 16  
Read/write head, 159  
Real time clock, 198  
Relative positioning, 215  
Repeat dialing, 110  
Replacement keyboards, 228  
Reviews, evaluation in, 15-16  
Reviews, structure of, 17  
RFI, 91  
RGB cards, 143-148  
RGB interface card, 64K, 145-146  
RGB interface card, *II*c, 146-147  
RGB monitor, 123  
RGB signal, 143  
RGB-1400PC Display monitor, 138  
RGB-SL7 card, 145  
Ribbons, printer, 21  
RS-232C interface standard, 21-22, 90  
RVM-II RGB card, 144  
RX-80, RX-80FT, and RX-100 printers, 49-51

## S

SA390-E Drive, 173  
SC-100 monitor, 138-139  
SC14 Signal AC Line Conditioner, 266  
Scribe printer, 51-53  
Security, 248-249  
Serial to Parallel Adaptor, 103  
Serial printer interface, 103-104  
Set answerback string, 110  
Set attention character, 110  
Set backspace character, 110  
Set disconnect character, 110  
SG-1000 monitor, 139-140  
Shadow mask, 122  
Shift key mod, 227  
Shopping at computer fairs, 13  
Shopping at retail stores, 11-12  
Shopping for used equipment, 13-14  
Shopping, mail-order, 12-13  
ShuffleBuffer, 266-267  
Small system parameter area, 237  
Smarterm II wide display card, 153  
SoftCard II, 242-243  
Software compatibility, 17  
Sound cards, 204-211  
Sound effects, 205  
SPA, 237  
Specialty keyboards, 228  
Spikemaster surge protector, 267  
Spirit 80 printer, 53-55  
SPS Standby Power Source, 268  
SQ-5BA hard disk, 185  
Standby systems, 248  
STX 80 printer, 55-56  
Style Writer printer, 82-83  
Super isolation transformers, 247-248  
Super Music Synthesizer, 209-210  
Super Serial Card *II*e printer/modem interface, 104  
Synetix Flashcard RAM card, 194-195

## T

Tables of ratings and features, 18  
Taur II disk drive, 173-174  
Taur II+ disk drive, 174  
Tender Keypad, *II*e, 234  
The Keypad, 233-234  
The MAX SS/2 surge protector, 257-258  
The Source, 110-111  
Thermal printer, 23  
Thermal transfer process, 52  
Thimble printer, 63  
Thunderclock, 200-201  
Timemaster II H.O. clock, 201-202  
Titan RAMcards, 195  
Touch ring light pen, 213  
Touch tablets, 214



TPA, 237  
Transient program area, 237  
Transient surge suppressors, 247  
Transmission speed of modems,  
108-109

Transtar 120 printer, 84-85  
Transtar 130 printer, 85-86  
Trustor Information Modules hard  
disk, 185-186  
TTX-1014 printer, 86-87  
TTXpress printer, 56-58  
TV as a monitor, 123-124

#### **U**

Ultraterm wide display card, 153-154

Unidirectional printing, 23  
UniPrint printer interface, 104-105  
UPS, 248

#### **V**

V1200 disk drive, 175  
Vendor support, 17  
Videoterm wide display card,  
154-155  
Viewmaster wide display card, 156  
Vista Solo disk drive, 174  
Voice synthesis, 204  
Volsmodem, 119-120  
Voltage regulations, 248

#### **W**

Wide display cards, 149-157  
Word processor, setting up a, 22  
Worksheets, 18  
Write protection notch, 159

#### **X**

X100 POPCOM modem, 120  
X5 hard disk, 186

#### **Z**

Z Engine coprocessor card, 243  
Z-80 coprocessors, 236-245  
Z-80 Plus coprocessor card, 243-244



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Gary Phillips has more than 22 years of experience as a computer consultant, programmer, systems engineer, educator, and technical writer. He has also authored 17 books for the personal computer user including *TAB's Commodore 64™ Expansion Guide*.



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